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OCT. 25, 1954

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Aviation Week

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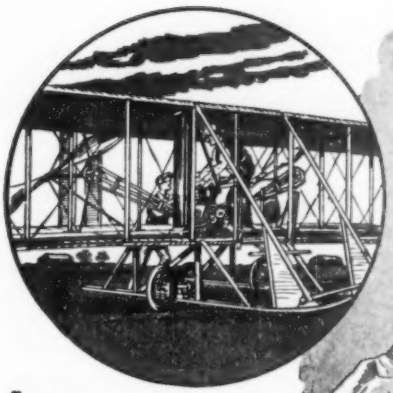
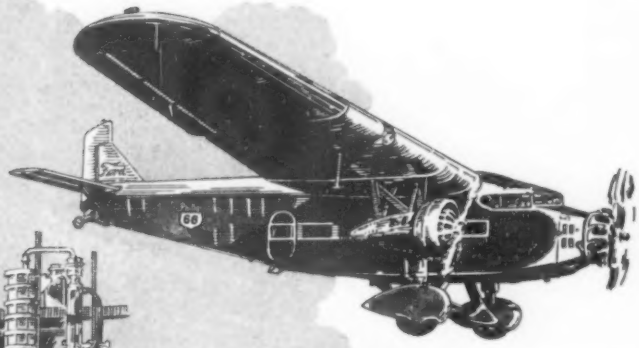
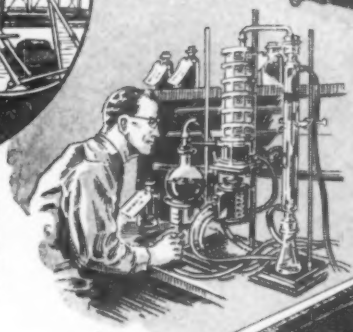
MILESTONES IN AVIATION

How Phillips 66 Pioneered in High Test Aviation Fuel

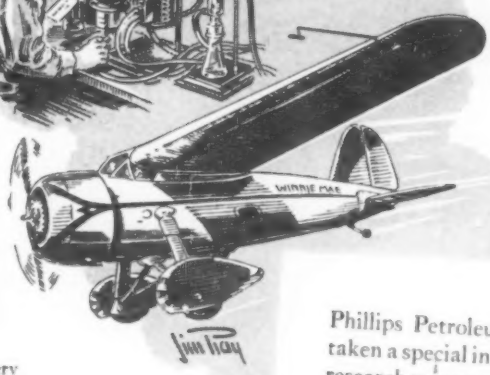


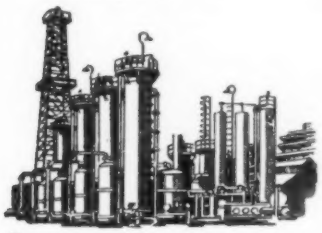
1 Until the early Twenties, airplane engines were often started in cold weather by using ether in a priming cup built into the intake manifold. Engines sputtered until they became hot enough to vaporize regular gasoline.



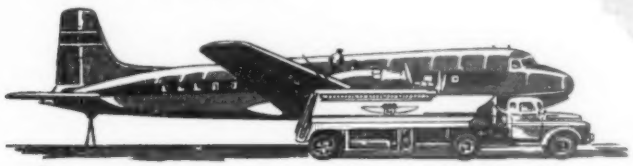


2 Then Phillips Petroleum Company scientists blended liquids from natural gas into aviation fuel—a process which resulted in faster engine warm-up, easier, quicker starts, smoother operation. The powerful, highly volatile elements of natural gasoline improved the performance of aviation engines.





3 In 1942, Phillips put in operation the very first HF alkylation plant—for the production of HF Alkylate, a high-power, high-performance aviation fuel component.



4 Today, Phillips produces tremendous quantities of 115/145 grade aviation gasoline for commercial and military use.

Phillips Petroleum Company has always taken a special interest in aviation. Phillips research programs have always laid special emphasis on aviation needs, and Phillips took an active part in the early, crucial setting up of standards for aviation fuels and lubricants. Phillips research and manufacturing have led the way in the production of many of the major ingredients of aviation gasolines.

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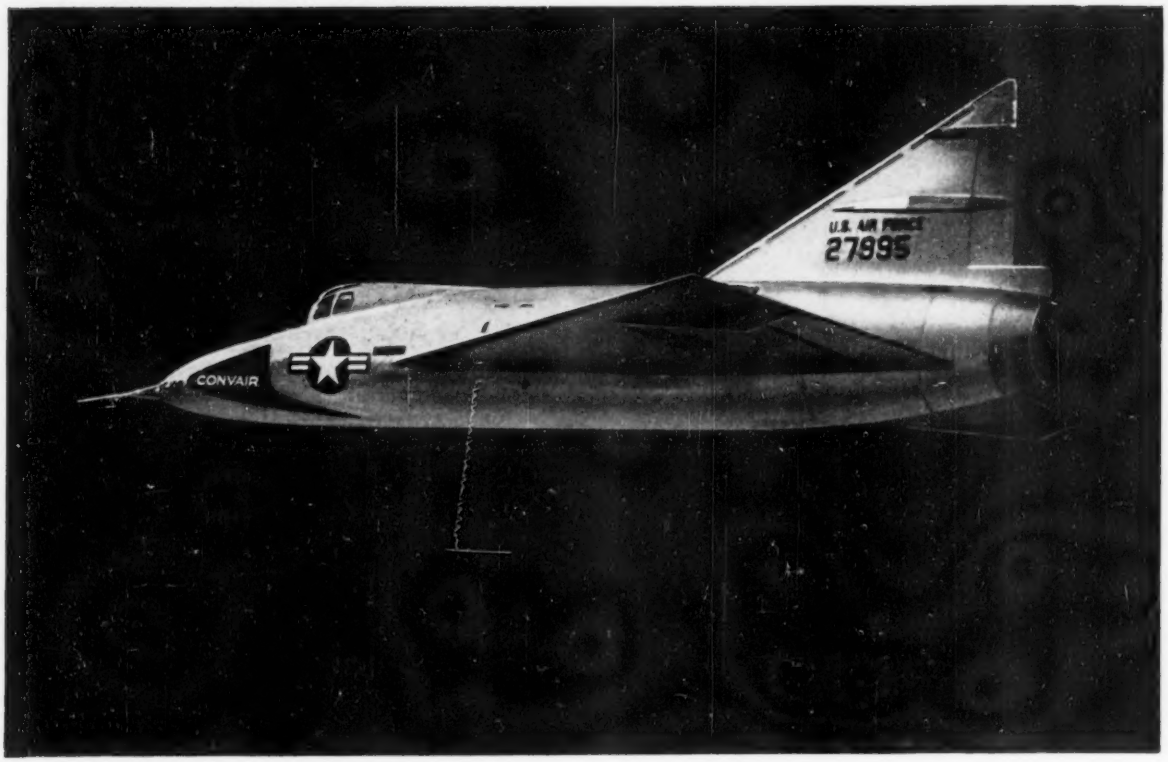

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NEWS DIGEST

New XT-37 Takes Off on First Test

USAF's first side-by-side jet trainer, Cessna Aircraft Co.'s new XT-37, takes off on its initial flight at Wichita Municipal Airport (Aviation Week Oct. 18, p. 15). The flight marks the beginning of the twin-jet intermediary trainer's test program by Cessna and Air Force pilots. Switch from conventional tandem seating is expected to increase USAF instruction efficiency.

Domestic

Merger proposals from Eastern and National Airlines to Colonial are being held up until a Civil Aeronautics Board pre-hearing conference, scheduled for Nov. 3, determines the alleged EAL-CAI control issue—key factor in the consolidation procedure (AVIATION WEEK Sept. 20, p. 95). Colonial has set Dec. 20 as the new deadline for merger bids.

David S. Smith, attorney, Navy veteran and former State Department official, is the new Assistant Secretary of the Air Force for Manpower and Personnel.

New heightfinder radar for air defense, reported able to spot aircraft at three times the range of its predecessors, has been developed by General Electric Co. and Rome Air Development Center. GE is producing the new radar in both fixed and mobile versions.

Automatic fire control systems for Army's Skysweeper anti-aircraft cannon will be produced by Sperry Gyroscope Co. at Great Neck, N. Y., under a new $18-million contract.

Northwest Orient Airlines last week settled for about $240,000 the 30 death claims filed after an NWA Martin 2-0-2 crashed into a 500-ft. bluff near Winona, Minn., Aug. 29, 1948, killed 36 persons. Northwest and Glenn L. Martin Co., also named a defendant, will litigate the share each is to pay.

Three improved models of Project Volscan, automatic traffic control computer developed by the Air Force Cambridge Research Center, have been ordered by USAF for operation evaluation. The improved version, manufactured by Avco's Crosley Division, will be able to schedule takeoffs and landings and provide more flexibility in altitude scheduling. Air Navigation Development Board hopes to participate in one evaluation, slated for Wright Air Development Center.

New $3-million Air Force contract has been awarded Lear, Inc., Santa Monica, Calif., for production of its MB-2 autopilot, scheduled to be installed on Republic F-84Fs (AVIATION WEEK June 28, p. 11).

Fairchild Engine & Airplane Corp. has formed a Kinetics Division through absorption of Gassner Engineering, consulting group in aircraft, electronics reinforced plastic, special machinery and railroads. Alfred A. Gassner will be general manager, with offices in New York.

J48 production will be continued at Pratt & Whitney Aircraft's East Hartford, Conn., plant under additional orders placed by the Navy.

Lightplane builders exported 42 aircraft valued at $741,247 last month, bringing the total so far this year to 403 at $5,920,431, Aircraft Industries Assn. reports.

Herbert L. Sharlock, 76, former public relations and advertising director for Bendix Aviation Corp. and a prime mover in setting up the annual Bendix air races, died Oct. 18 at Elmira, N. Y.

Financial

Flying Tiger Line reports a loss of $425,545 for the fiscal year ended June 30, compared with a net profit of $1,853,155 for the previous 12-month period. Revenues totaled $18,642,919, dropping from $24,504,099 for fiscal 1952-53. FTL blames the deficit on "severe adjustments" in the Pacific airlift and delays in the proposed merger with Slick Airways (also see p. 100).

United Air Lines has declared a regular quarterly dividend of 25 cents plus an extra 50 cents on common stock, payable Dec. 15 to holders of record Nov. 15.

Fairchild Engine & Airplane Corp., Hagerstown, Md., will pay a 30-cent dividend on common stock Nov. 1 to holders of record Oct. 20.

International

Scandinavian Airlines System has ordered eight longrange DC-7Cs from Douglas Aircraft Corp., expects deliveries in the summer of 1956. Cost for each transport: $3 million.

Aviateca DC-3 crashed Oct. 9 while trying to make an emergency landing in a river near La Florida, Guatemala, according to reports last week from Guatemala City.

Air Chief Marshal Sir Charles Medhurst, 57 chief of the Royal Air Force staff of Britain's joint services mission in Washington, D. C., from 1948 to 1950 died Oct. 18, in Lymington, England.

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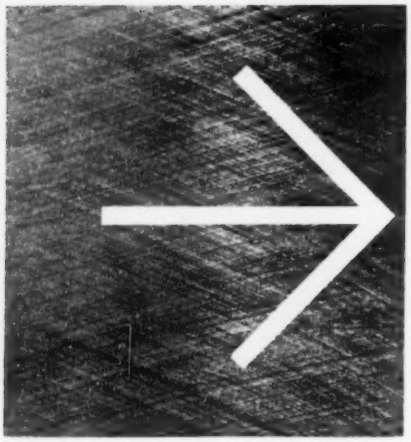
READY FOR DELIVERY, these F-100 Super Sabres line up at North American Aviation's Los Angeles plant prior to being taken over by U. S. Air Force squadrons.

Military Planes In the News

NEAR VERTICAL BANK shows the high maneuverability of Martin's P5M-2 Marlin, Navy's newest and largest anti-submarine plane. First P5M-2s have been delivered to the Navy for operation on the West Coast.

IN THE SLOT, the McDonnell F3H-1N Demon shows its head-on silhouette as the new Navy fighter comes in for a landing with its flaps lowered and wheels down.



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WHO'S WHERE

In the Front Office

Carleton Putnam has resigned as board chairman of Delta-C&S Air Lines, will continue to serve as a director.

Rowland Burnstan, onetime president of Lawrance Aeronautical Corp. and former director of Minneapolis-Honeywell Regulator Co.'s Aeronautical Division, is new president of Borg-Warner International Corp. He succeeds **John W. DeLind, Jr.,** elected board chairman of the export subsidiary of Borg-Warner Corp., Chicago.

Robert L. Earle has become executive vice president of Marquardt Aircraft Co., Van Nuys, Calif.

Robert M. Benson has been appointed a vice president of Gyromechanisms, Inc., Halesite, N. Y., will take charge of the company's West Coast Division in Los Angeles.

Jack C. Charleson, former manager of Piasecki Helicopter Corp.'s Canadian Division, is new managing director and member of the board of United Helicopters, Ltd., Ottawa, wholly owned subsidiary of Okanagan Helicopters, Ltd.

Felix Aimonetti has moved up to vice president and works manager of Link Aeronautical Corp., Endicott, N. Y. Other new officers: **Arthur T. Healy,** secretary-treasurer; **David J. Vaughan,** sales manager.

Arthur E. Abney has been appointed director of the Illinois State Department of Aeronautics.

Emil Jarz, formerly with personnel and labor relations for American Overseas and American Airlines, has been elected president of Mead & Wheeler Co., Chicago furniture and office equipment firm.

Air Commodore F. R. Banks has been elected a director of Bristol Aeroplane Co., Bristol, England.

Changes

Robert Insley, former vice president-manufacturing for Continental Aviation & Engineering Corp., has joined the Ford Motor Co. as chief product engineer of the Aircraft Engine Division, Chicago.

J. Nelson Kelly is new general manager of Lear's Aircraft Service Division, Santa Monica, Calif. Other changes: **Donald W. Cook,** California industrial relations manager; **Harry Sosnoski,** senior Washington, D. C., representative.

Leo M. Chattler, former chief of the actuating and flight control systems section of Navy's Bureau of Aeronautics, has joined the National Water Lift Co., Kalamazoo, Mich., as chief engineer.

Honors and Elections

Walter A. Spivak, chief product engineer for North American Aviation, and **Dr. Homer J. Stewart,** professor of aeronautics at the California Institute of Technology, have received "outstanding achievement" awards from the University of Minnesota's Department of Engineering.

Mrs. Betty H. Gillies has been elected chairman of the All-Women Transcontinental Air Race board of directors.

INDUSTRY OBSERVER

► Navy is ordering more Grumman F9F-8 sweptwing fighters to compensate for slow deliveries of the Chance Vought F7U-3 Cutlass and McDonnell F3H Demon. F9F-8 is powered by a 7,250-lb.-thrust version of the Pratt & Whitney Aircraft J48 turbojet.

► **Avro Canada and Bristol Aeroplane Co. of England are collaborating on modification of the Avro Orenda jet engine to take the Bristol lightweight simplified afterburner. F-86 Sabres built by Canadair and powered by the Orenda will be equipped with the Bristol afterburner to improve performance at fighting altitudes. Bristol afterburner provides little additional power on takeoff, but gives up to 40% thrust augmentation at combat altitudes.**

► Douglas is completing another rocket-powered version of the D-558-II Skyrocket research aircraft for the National Advisory Committee for Aeronautics. No significant design changes have been incorporated in the new Skyrocket, which will be used by NACA for further flight research in the supersonic range at Edwards AFB.

► **First production increment of the Convair B-58 Hustler supersonic bomber will be powered by an advanced model of the Pratt & Whitney J57 turbojet. Later Hustlers are scheduled for the General Electric J79 still under development. USAF recently confirmed that the Hustler has been ordered into production (Aviation Week May 24, p. 13; Oct. 18, p. 14).**

► Peter Masefield, chief executive of British European Airways, confirmed the Douglas sales effort for a 40-50-passenger twin-engine, turboprop-powered helicopter (Aviation Week Oct. 4, p. 11) at a recent press conference in London. He confirmed that the Douglas helicopter was scheduled to be powered by the Rolls-Royce R.B.109 turboprop and said BEA is extremely interested.

► **Northrop F-89 Scorpion series has not yet reached its aerodynamic ceiling, although the plane has been flown consistently above the 52,000-ft. level in pilot indoctrination. Northrop is planning increased power to boost the Scorpion's ceiling and the all-weather fighter's maximum maneuvering speed at extreme altitude.**

► Boeing has three experimental turboprop aircraft undergoing engine ground tests preparatory to first flights. One is the B-47D with two Wright T49 turboprops replacing the two inboard twin General Electric J47 turbojet pods. The single J47 installations remain in the outboard pods. Two KC-97s have been equipped with Pratt & Whitney Aircraft T34 turboprops, replacing the R4360 Wasp Major piston engines.

► **Bristol Aeroplane Co. is experimenting with durestos, a reinforced phenolic plastic using asbestos as a strengthening material for wing and fuselage structures, on both aircraft and missiles. Current experiments involve a 10-ft. durestos wing for transonic speed range and fuselage sections for large aircraft in addition to applications on Bristol's ramjet missile.**

► Piasecki's YH-16 40-passenger helicopter has finished extensive ground runs and is scheduled to resume flying this week. Next test phase calls for 80 hr. flying. The H-16A, gas turbine-powered version, is nearing completion and is scheduled to begin ground testing soon.

► **Boeing B-47E is equipped with a chaff chute on the side of the fuselage just back of the wing. Speculation that the chutes are for scattering "window" tinfoil strips to interfere with enemy ground and airborne radar is supported by the latest Commerce Department contract announcement. These include nearly a million dollars divided between Cochran Foil Co., Louisville, and Johnston Foil Co., St. Louis, to tool up for "chaff" production.**

► Navy Bureau of Aeronautics has awarded contracts for design studies of one-man helicopters to Hiller, Gyrodyne and Kellett.

Washington Roundup

Pentagon Mixup

Statement in Philadelphia speech by Navy Secretary Charles S. Thomas that Russia "has atomic weapons and aircraft faster than the speed of sound with which to deliver them" created another day of stress in the Pentagon. Immediate Navy explanation was that Thomas did not say Soviet planes could fly at supersonic speed when loaded with the weapon.

His office pointed out that the Secretary did not say "bombers" although many persons assumed that only bombers can carry the A-bomb. General Pentagon reaction was that Thomas misspoke, did not mean to say U.S. officially recognizes Russian claim to flight faster than sound.

Two days after Thomas' speech, Adm. Arthur Radford, Chairman of the Joint Chiefs of Staff, told a Chicago audience that comparisons of U.S. airpower with that of Russia are "liable to misinterpretation." He said, "It also should be remembered that we know exactly what we have. We do not have the same certainty about what the Soviets have."

Plastics Problem

USAF is conducting a survey among airframe manufacturers to determine why they are not making more extensive use of reinforced plastic materials in aircraft and missiles. USAF is interested in pushing reinforced plastics wherever applicable because they save structural weight and strategic metals.

Meanwhile, Zenith Plastic Co. recently sponsored a forum of suppliers to the reinforced plastic fabricators aimed at developing better materials in this field.

Airpower Budget Boost

Pentagon is now in the throes of preparing the fiscal 1956 military budget at the Army, Navy and Air Force levels. AVIATION WEEK predictions that the airpower budget will be boosted for fiscal 1956 are being borne out in the preliminary budgeting at service level.

Airway User Charges

Civil Aeronautics Authority is sticking to its guns on the thorny problem of airway user charges.

Says Donald S. King, a planning staff member of CAA's Office of Airways:

"The position of the CAA is that while favoring relief for the general taxpayer, there should be no discrimination against aviation industry or airway users, and that airway user charges should be a part of an over-all program which should apply to all users of federally provided facilities in the transportation field."

The user charges problem has been batted around since 1945 when it was brought up in a congressional hearing and has been discussed every year since then. It probably will receive its annual going-over at the next session of Congress.

Bitten but Unbowed

Defense Secretary Wilson, who swore off political speechmaking after his unfortunate mixup with bird dogs and kennel dogs, returns to the fray late this week in Dayton, Ohio. Still receiving invitations to address GOP rallies, he has agreed to speak in behalf of George H. Bender, Republican senatorial candidate in Ohio.

Washington observers point out that of Wilson's four predecessors only Louis Johnson, a Truman appointee and Democrat, took an active part in politics.

Contract News Fumbles

Pentagon press corps is becoming increasingly irritated by Defense Department handling of news about contract awards. Says one seasoned reporter: "I don't care if I have to dig for this stuff along with everybody else, but I gotta know where to dig and for what part of it." Recent USAF release, issued less than a month before election, listed incomplete summary of Air Force contracts awarded since Sept. 1. Reporters were unable to get data on how much money was being spent with each company.

One day later, figures were printed by Commerce Department, for some of contracts not for others (see p. 16). In another case, the Army put out a special press release in Washington on a $16-million project to prepare a Charlotte ordnance plant for Nike production. The same day a local release was made in New York about award of a $164.8-million contract for actual output of the missile. Reporters were accused of missing the big story, and Army fumbled for several hours finding out if the New York report was true.

Democratic Chairmen?

Next week's election holds the prospect of a switch to Democratic control of congressional committees handling military and civil aviation.

Chairmanship of Senate Armed Services Committee would go to Sen. Richard Russell, who fought Eisenhower's cutback last year in Air Force funds. Sen. Stuart Symington, former USAF Secretary, would become a majority member, eligible for a subcommittee chairmanship.

House Armed Services Committee chairmanship would go to Rep. Carl Vinson, who also opposed the USAF cutback last year, and in the pre-Korea period opposed the Truman Administration's cutback in the 70-group air program.

Chairmanship of Senate Interstate and Foreign Commerce would go to Sen. Warren Magnuson, firmly opposed to elimination of competition in international aviation.

Rep. Percy Priest, longtime aviation enthusiast, would take over chairmanship of House Interstate and Foreign Commerce for the first time. Rep. Robert Crosser who headed the committee in the last Democratic Congress was defeated in the Ohio primary.

Export Safeguard

Civil Aeronautics Administration has launched a new effort to put foreign purchasers on guard against substandard aircraft and spares purchased from unethical U.S. dealers. Procedure now delegates responsibility to exporter for meeting specifications set down by the customer.

As always, practical effect is one of "buyer beware," but CAA hopes publicity given to new regulation will result in more caution by foreign shoppers. Program was pushed by ethical dealers who had to compete with material sorted out as usable by scrap metal operators and sold off in export market. —**Washington staff**

AVIATION WEEK

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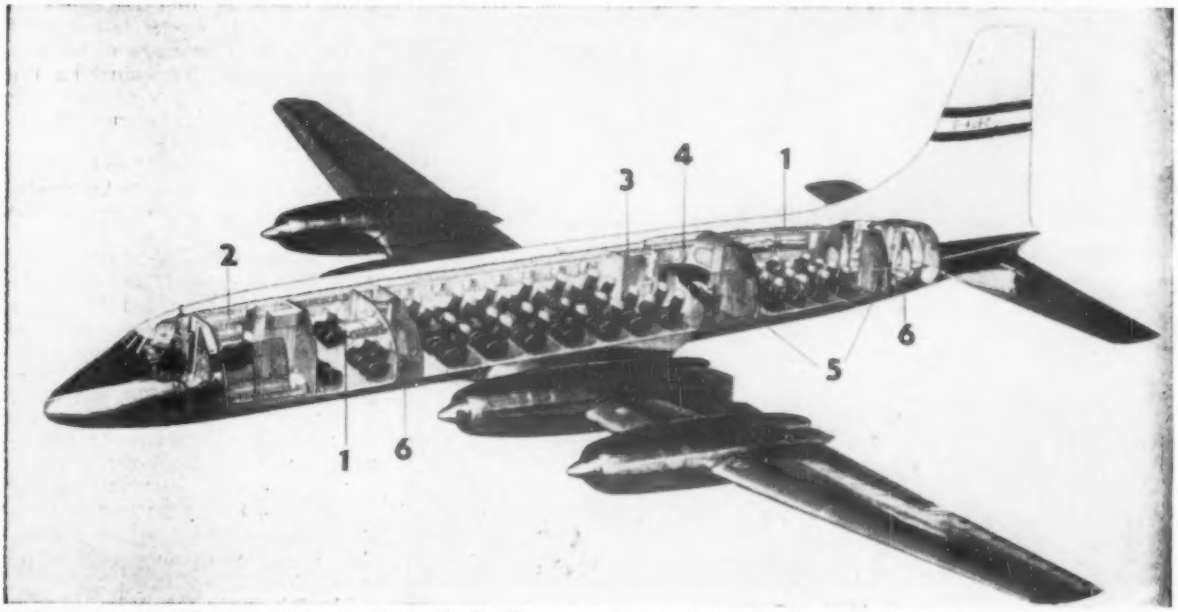


BRITANNIA MK. 100 cutaway shows (1) sleeping berths (2) crew compartment (3) galley (4) lounge (5) coat storage (6) toilets.

Britannia and B. E. 25 Turboprop Are Keys as . . .

Bristol Bids for Transport Leadership

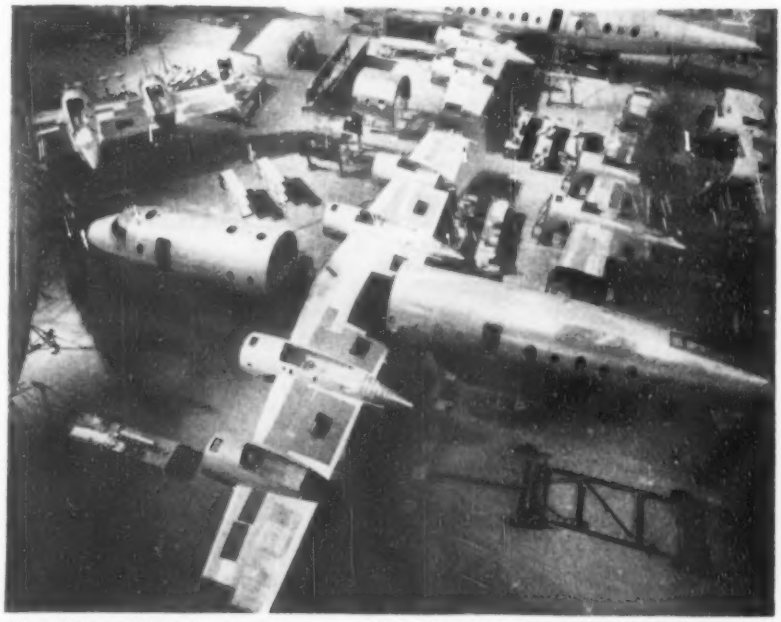
By Robert Hotz

Bristol, England—Challenge of Bristol Aeroplane Co. to American leadership in the longrange international transport market is based on a firm faith in the turboprop engine and a 10-year development program for its Britannia airframe.

Bristol and Douglas Aircraft Corp. are locked in a battle for the strategic British Overseas Airways Corp. market for turboprop transports. BOAC has 33 Britannias on order but is negotiating with Douglas for a turboprop version of the DC-7 series (AVIATION WEEK Oct. 18, p. 13).

▶ **Development Goal**—Bristol's combined engine and airframe development program is aimed at producing a transport by the early 1960s that will cruise at 500 mph. with a specific fuel consumption of .36 lb./eph./hr. and carry payloads of 100 passengers nonstop both ways between New York and European capitals.

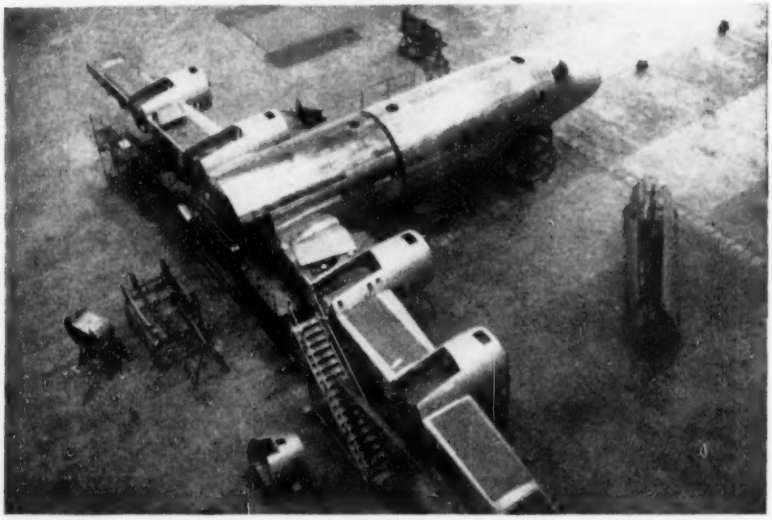
This Super-Britannia admittedly is a long way off, but Bristol offers it as proof of its faith in turboprop development for airline use and its determination to challenge successfully current American domination of the world airline market.



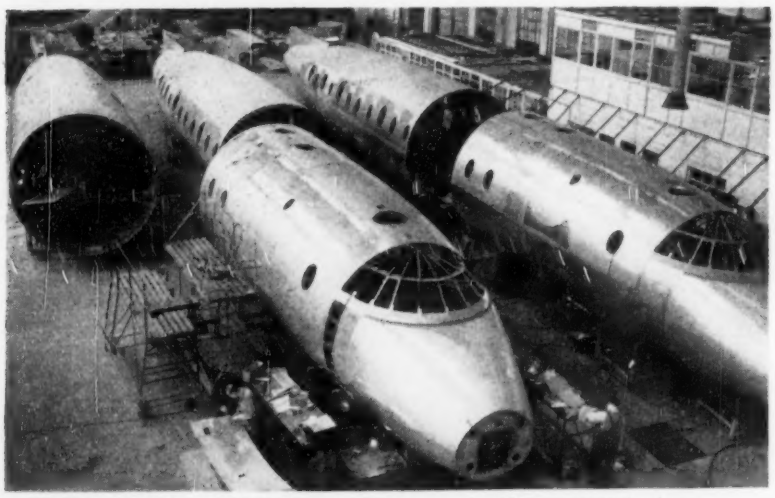
BRITANNIA WING is joined to fore and aft fuselages at extra-strong saddle section.

Timetable of the Bristol development program is aimed at catching and surpassing similar advanced transport developments planned by Douglas and Lockheed Aircraft Corp. Between the advent of the advanced Super-Britannia and the Mark 100 version now in production are the six development stages

BRITANNIA 100S for BOAC are shown being assembled at Bristol's Filton plant.



BRITANNIA 300 (prototype above) is version Bristol is plugging to foreign lines.



ANOTHER VIEW OF FILTON plant shows Britannia 100 fore and aft fuselages.

listed in the accompanying table (p. 15).

▶ **Power Diversions**—Key to Britannia development is the new split compressor supercharged B.E.25 turboprop laid down by Bristol as a privately financed venture under the leadership of Dr. Stanley G. Hooker, chief engineer of its Engine Division.

The B.E. 25 basically is an 8,000-shaft-horsepower engine, of which only 4,000 shaft horsepower actually are absorbed by the reduction gear and transmitted to the propeller shaft. The remaining power can be diverted for a variety of functions, including:

- Supercharging the high-pressure section of the engine to maintain a constant 4,000-shaft-horsepower output to altitudes over 20,000 ft.
- Bleed air for a boundary-layer control system operating over the Britannia flaps to provide shorter takeoff runs. Excess air from only two of the four Britannia engines is required for this operation.
- Bleed air for cabin pressurization to maximum altitude.

The B.E. 25 has an 11-to-1 pressure ratio that permits extremely low specific fuel consumption at cruising altitudes and speeds.

▶ **Jet Augmentation**—At sea level, the 4,000 shaft horsepower is augmented by about 2,700 lb. jet thrust for a total of 5,000 equivalent horsepower. The shaft horsepower remains constant to over 20,000 ft. altitude, with jet thrust diminishing gradually with altitude.

At 36,000 ft., the B.E. 25 will give the Britannia 3,000 ehp. and a cruising speed of 400 mph., with a specific fuel consumption of .38 lb./ehp./hr.

The supercharged B.E. 25 will provide constant takeoff power for any altitude and temperature encountered at any airport in the world.

The B.E. 25 is about 9 ft. long with a maximum diameter just over 41 in. and weighs about 3,000 lb. It utilizes the same propellers and reduction gear developed for the advanced Proteus turboprop. The compressor is split into low- and high-pressure units. The high-pressure compressor is linked to the single high-pressure turbine while the low-pressure compressor is connected to three low-pressure turbines and the reduction gear transmitting power to the propeller shaft.

▶ **1959 Availability**—Bristol now is in the component testing stage of B.E. 25 development and expects to run a complete engine on the test stand early next year. It is in about the same state of development as the Rolls-Royce RB-109, a split-compressor unsupercharged 4,000-shaft-horsepower gas turbine being considered by Douglas for its turboprop transports.

Both engines are expected to be available in 1959, but Bristol is counting heavily on the B.E. 25's high cruise power and low fuel specifics at altitude to shade the Rolls entry for airline operations.

The B.E. 25 will be a straight replacement for the Proteus 755 turboprop in late versions of the longrange Mark 300 Britannia. It will give this version of the Britannia a 50-mph. boost in cruising speed to 400 mph. and a performance bonus that can be taken either in a 25% increase in range (carrying additional fuel) or a 25% increase in payload over the same range as the Proteus 755-powered Mark 300 LR.

The swap of the B.E. 25 for the

Proteus will be fairly simple structurally in the Britannia and can be done by airline operators during major overhauls in their own shops.

▶**Thin-Wing Version**—The B.E. 25 will take the Britannia airframe up to its current limitation below Mach .7.

For further performance stretch, Bristol plans a thin-wing version of the Britannia using advanced versions of the B.E. 25 aimed at still lower fuel specifics that will provide the ultimate 500-mph. cruising speed over 4,000-6,000-mi. stage lengths.

Prototype of this advanced version of the Super-Britannia should make its appearance in the early 1960s.

▶**Bridging the Gap**—As an interim measure to bridge the gap between the current Proteus 705 engine and the B.E.25, Bristol has developed a much improved Proteus 755. The new Proteus will fit into the Britannia series beginning with the medium-range Mark 300 version, due for delivery to BOAC in 1955.

The Proteus 755 incorporates several features aimed at avoiding repetition of the engine failure that caused a forced landing and washout of the first Proteus 705-powered Britannia.

In this accident the reduction gear failed, allowing the free turbine to overspeed and throw blades. Blades ruptured the oil tank and fuel line, causing a serious fire.

▶**New Braking Device**—A new double helical reduction gear has been substituted on both the 705s now flying and the new 755.

A braking device to prevent turbine overspeed and provide an automatic fuel cutoff beyond certain turbine rpm. has been developed for the 755. All-steel compressor blades and elimination of both the cabin supercharger and accessory drive shafts are other features of the 755.

A 54-kw. generator is provided for remote accessory power, and cabin supercharging is done with air bled from the compressor. The Proteus 755 has completed a 500-hr. endurance run, including 200 hr. at takeoff power of 4,180 ehp., compared with 3,780 ehp., for the 705.

The 705 using the new reduction gear will power the first 15 Britannia Mark 100s now under construction at Bristol's Filton plant. The 755 will power the Mark 300 prototype now being assembled and the longrange Mark 300 and Mark 250 production versions being built for BOAC and Qantas Empire Airways of Australia. The Mark 250 is a mixed passenger-cargo version specifically requested by Qantas.

▶**1,000-Hr. Overhaul Goal**—Bristol is aiming for a service life of 1,000 hr. between overhauls within two years after the Proteus 755 goes into regular BOAC service.

Britannia Development Plan

Model	Engines	Passengers	Max. fuel load*	Length	Payload lb.	Still air range **	Econ. cruise ***	Flight date
100	Proteus 705 (3,750 ehp.)	65-92	6,800	114	15,000 25,000	5,270 4,100	340	1954
300	Proteus 755 (4,150 ehp.)	65-101	6,800	124½	18,000 30,000	5,180 3,800	350	1955
250 LR	Proteus 755 (4,150 ehp.)	65-87 plus cargo space	8,300	124½	16,000 36,500	6,100 3,740	350	1956
300 LR	Proteus 755 (4,150 ehp.)	65-101	8,300	124½	16,000 30,000	6,100 4,500	350	1956
Super	B.E. 25 (5,000 ehp.)	65-101	10,500	124½	30,000 37,500	5,600 4,500	400	1959
Advanced development	B.E. 25 (? ehp.)	65-101	....	(thin wing)	"	"	500	1962

*Imperial gallons **Statute miles. ***True air speed.

BOAC's current plans call for beginning pilot training and route familiarization with the Mark 100 on African and Orient flights early next year. Tourist passenger service is planned for early 1956.

The medium-range Mark 300 version may be introduced on the North Atlantic, although it can make the London-New York flight nonstop in only 15% of the winter weather and 60% during summer.

The longrange Mark 300 will be delivered to BOAC in 1956 and is aimed at doing the New York-London operation nonstop in 95% of all weather. It should be directly competitive with the Douglas DC-7Cs that will be going into trans-Atlantic service with Pan American World Airways the same year.

▶**350-Mph. Cruising**—The longrange Mark 300 version will gross 165,000 lb. and carry 8,300 imperial gal. of fuel, using integral wingtip tanks with milled skins substituted for the conventional construction for better tank sealing. It is expected to cruise at 350 mph. at 30,000 ft. altitude with a fuel specific of .495.

Bristol is concentrating its sales campaign of the longrange Mark 300 and is offering it to other operators besides BOAC for 1957 delivery.

Price is about $2,250,000 without spares and radio.

Bristol plans to accelerate production at Filton to Britannias per month, supplemented by an additional two monthly at Short Brothers' Belfast plant. Bristol recently acquired 15% of the Short stock.

With production rolling at 50 planes a year, Bristol sees no problem keeping up with airline demand.

▶**Operator Showcase**—Key to future Britannia sales will be its performance on BOAC routes. Bristol recognizes the difficulty of cracking the airline market without a satisfied operator to use as a showcase.

It is concentrating on making a good showing with BOAC while spreading the Britannia word among European, Asiatic and U. S. airlines.

▶**Hedging Bad Luck**—Meanwhile, BOAC—with the experience of being stung badly in postwar succession by the Avro Tudor, the Handley Page Hermes and the de Havilland Comet while pioneering British airliners—apparently is hedging against any Britannia bad luck by negotiating with Douglas for the DC-7D powered by the Rolls-Royce R.B.109.

BOAC says it hopes to have pioneered turboprop operation over its far flung routes with the Britannia by the time the DC-7D is available and Bristol hopes nothing happens to upset that timetable.

The Bristol sales campaign is stressing the Britannia series as a compliment to the Viscount, taking over in the 800-1,000-mi. stage length where the Vickers transport stops. It is emphasizing the operational flexibility of the Britannia, which enables an operator to standardize on one type of equipment for both medium- and longhaul routes.

The company also is banking on the large successive waves of postwar immigration from Europe to Africa, Australia, Canada and the Middle East to stimulate a continued growth of longrange air travel for the future. Bristol believes that the bulk of this air travel growth will be in aircoach and therefore is stressing the high-density, six-abreast seating versions of the Britannia series with its rail-anchored seats that make quick conversion of seating possible.

It also is counting on the operating economy of the turboprop as a bigger attraction for airlines than the high speed of the turbojet transport.

Union Strength

- **Aircraft labor ties new negotiations to elections.**
- **Leaders predict 'hostile' bargaining if GOP wins.**

Los Angeles—West Coast aircraft labor unions are looking to the Nov. 2 national elections to determine the strength of their position in the new round of labor negotiations now beginning in California.

Bargaining already has opened at some plants, with unions seeking general wage increases ranging from 6% to 8%.

"We expect a very hostile management again if the Republicans take over in Washington for another two years," one labor leader says. "The Senate is the crucial spot."

▶ **New Bargaining Chief**—One of the most significant developments in the aircraft labor picture has been the announcement by the United Auto Workers (CIO) that president Walter P. Reuther will be the new director of the North American Aviation bargaining council.

Reuther's appointment followed the resignation of former director John W. Livingston, who retains his duties as director of the General Motors Department and the National Aircraft Department of the international union.

UAW-CIO again will press for elimination of the auto-aircraft differential in its bargaining with North American, but just how strong a fight will be made depends on the outcome of the November elections.

Election of a friendly Congress will encourage the union to make a determined effort in its NAA bargaining.

▶ **Top-Level Fight**—Naming of Reuther to head up the union team may indicate an intention to carry the fight directly to North American's board chairman, J. H. (Dutch) Kindelberger.

During last year's bitter strike, at least one Administration official attempted to bring Kindelberger together with union negotiators. The NAA executive spurned the meeting.

Appointment of Reuther may be a move to bring into the bargaining someone of sufficient national stature to deal directly with Kindelberger.

This theory is given further support by the fact that Reuther will not take part in the early bargaining. He has named his top administrative assistant, Jack Conway, to coordinate the talks.

▶ **New Proposals**—Leaders of UAW-CIO Local 887 say the proposals to be presented to North American are not yet in final form. They were to be submitted to a meeting Oct. 24.

The new contract proposals must be placed before NAA by Nov. 5, and negotiations are scheduled to start on or before Nov. 15.

The differential in auto and aircraft wages that the union will seek to eliminate stands at present between 15 and 17 cents. Elimination of the differential would mean about an 8% wage boost in addition to fringe benefits that will be sought.

▶ **Renewed Alliance**—Despite a split last fall when International Association of Machinists (AFL) failed to follow UAW-CIO onto the aircraft picket line (AVIATION WEEK Dec. 14, p. 18), UAW-CIO leaders say the two unions again will work together.

IAM-AFL already has opened bargaining with Douglas Aircraft Co.'s El Segundo and Santa Monica Divisions. It has asked for a 6% general wage increase, in addition to fringe benefits that include nine paid holidays instead of the present six. Also under discussion is a 35-hr. work week.

The union has asked extension of any agreement to April 1956, a clause that could bring some stability to the aircraft labor picture and also could peg aircraft wages at a high level during a period of cutback. It would enable the union to hold a firm position during the term of a possibly unfriendly Congress.

It can be expected that bargaining now underway will be extended until after the November elections despite contract expiration dates.

▶ **Strike-Plagued Winter?**—IAM contracts at Lockheed Aircraft Corp. expire Dec. 15 at Burbank and Jan. 1 at Bakersfield. Lockheed also is facing negotiations with the Engineers & Architects Assn. and the International Brotherhood of Electrical Workers.

IAM now is opening negotiations at Convair in San Diego, where the contract expires Dec. 14. —WJC

New USAF Contracts

Additional Air Force contracts were disclosed in Commerce Department's daily synopsis of procurement just 24 hr. after USAF Secretary Harold E. Talbott announced awards of more than $1 billion since Sept. 1 (Aviation Week Oct. 18, p. 14).

The synopsis also disclosed the value of several contracts announced by Talbott, who did not give value figures. Included on the list:

- Boeing Airplane Co., Seattle, 50 B-52Ds with spare parts and tools, $223,166,000. For the same aircraft produced at Wichita, $83 million. No production number was given for the Wichita plant.
- Lockheed Aircraft Corp., Marietta, Ga., for aircraft, spares, tools, ground handling equipment, $30 million. This presumably covers the C-130 order reported by Talbott.
- Convair, San Diego, for aircraft, spares and tools, $2.8 million.
- Facilities contracts to Convair for the production of the B-58 Hustler ($266,250) and North American Aviation for production of the F-100 ($2,546,000).
- Curtiss-Wright Corp., Caldwell, N. J., for propellers, $5,456,335.
- Turbojet engine orders to Ford Motor Co. ($22,208,200) and Allison Division of General Motors ($34,004,205). Ford will make the J57-F-13 and Allison the J71-A-9. The Allison order, previously announced, is for 275 engines.

Gnat Leads Lightweight Competition

Unofficial reports on the first round of evaluation for the North Atlantic Treaty Organization's lightweight fighter competition (Aviation Week Oct. 18, p. 11) indicate the British Folland Gnat aircraft in the lead, followed by the French Dassault Mystere 26 and the Italian Fiat GA-91.

The initial evaluation was conducted at a NATO meeting in Rome. Results of the final evaluation are expected to be completed by December in Paris.

Lead of the Gnat was credited to the recent flight demonstration of its prototype Midge at the 1954 Farnborough show and during a test period at the Royal Air Force flight test center at Boscombe Down, England, where eight RAF and Royal Navy pilots made 18 flights in three days.

A British Avro delta and several other French designs also are being submitted for the competition. They include the Breguet 1002 Taon, designed for two Armstrong Siddeley Viper or Turbomeca turbojets; a modification of the Sncaso Trident; the Sncase Durandal, powered by a Snecma Atar turbojet, and the Sfecmas Model 1402 Gerfaut, also powered by an Atar.

The French designs all use delta wings, except the sweptwing Taon.

Fatigue Blamed in Comet Crashes

RAE says failure resulted from cabin pressurization action and wing bending during many hours of flight.

By Seabrook Hull
(McGraw-Hill World News)

London—British Overseas Airways Corp.'s de Havilland Comet 1 crashed at Elba this year when a weak section of the pressurized cabin failed and explosive decompression sucked passengers and crew out of the jet transport and ripped off the top of the fuselage, the Royal Aircraft Establishment testified last week.

In brief, RAE findings before a court of inquiry into the Comet crashes boil down to: structural weakness in the main fuselage and resulting fatigue failure under the combined action of cabin pressurization and wing bending during many hours of flight operation.

An inevitable result of these conclusions will be changes in the Air Registration Board's pre-acceptance test requirements.

Because no witnesses and little wreckage were found after the Naples crash Apr. 8, RAE confined the bulk of its findings to BOAC's Comet G-ALYP that crashed at Elba Jan. 10. But an RAE spokesman said, "Owing to the absence of wreckage we are unable to form a definite opinion on the cause. . . . But the explanation offered above for the accident at Elba appears to be applicable. . . ."

▶ **Exhaustive Tests**—The government's conclusions were reached by RAE only after the most exhaustive test program ever carried out on a civil airliner. They were offered in evidence only after one Comet was tested to destruction, another had its fuel tanks ruptured, 70 full-fledged test flights were made in another, between 50 and 100 dynamic test models were broken up.

More than 5,500 "flights" were made in a specially designed, developed and built full-scale test rig, and 70% of the original aircraft (Elba crash) was recovered and reconstructed.

The Elba plane was the first Comet to go into commercial service. It had logged 3,681 flight hours.

▶ **The Crash**—The morning of the crash it arrived at Rome at 8:30 Greenwich Mean Time. At 9:31, it made a normal takeoff. At 9:50, the pilot reported that he was at 26,500 ft. and intended to continue climbing to his cruising altitude of 36,000 ft. That was the last Rome airport heard from him.

However, during its climb the Comet passed an Argonaut transport. During a brief radio conversation, the Argonaut pilot asked for the height of the cloud tops. Comet pilot radioed: "Did you get mine . . ." the message never was finished. Investigators surmise that was the moment when disaster struck.

Here's what RAE investigators believe occurred at that moment:

• **Initial failure** occurred around the rear ADF window (there are two in line on top of the fuselage just aft of the flight deck) and immediately ripped loose a section of the pressurized fuselage.

• **Explosive decompression** of the fuselage occurred immediately, expelling all occupants as from a gun. Simultaneously, the whole top of the central cabin back of the "A" in BOAC ripped off.

From work done with ⅛ scale models, RAE experts figure the cabin cleared of everything portable within a third of a second. In effect, after the first small rupture, there was an immediate disintegration of the central cabin.

Next, in rapid order, tail and fuselage aft of the rear wing spar came loose as a unit, the nose and outer half of the port wing came off, all as the result of heavy downward pressure.

The main wing section with the engines still intact then caught fire. The tail and after fuselage hit the sea intact, with the open fuselage section going in first. The burning wing fell in next. Other parts of the wreckage were scattered over a wide area.

▶ **Weak Point**—The specific weak point in the Comet 1, according to RAE, is at the corners of the windows. In repeated tests at Farnborough, fatigue failures showed up here.

At those points where DTD-546 aluminum alloy was used in the fuselage (with an ultimate static strength of 65,000 lb./sq. in.) RAE testers showed both in the air and on the ground that stress of 45,700 psi. was imposed two or three times per normal 3-hr. flight. This meant that 70% loads were applied repeatedly to these parts during the actual life of the airliner.

Compared to normally accepted maximums of 40-50%, this fact never showed up in the Comet pre-acceptance tests.

De Havilland ran compression tests on a section of the Comet cabin for equivalent of 54,000 flight hours before forcing a breakdown.

▶ **Tank Tests**—Although actual full details will become available to the general public only at the end of the inquiry, it is virtually certain that the only way RAE found them was through simultaneous wing bending and pressurization tests in a specially constructed tank designed to take a complete Comet 1 fuselage.

Normal practice of Britain's ARB is to proof-test pressurized aircraft hulls to one-third over the designed operational pressure. For the Comet, which carries a maximum of 8¼ lb./sq. in.—8,000-ft. cabin pressure at 40,000 ft.—this would normally have meant proof-testing to 11 psi.

However, on de Havilland's suggestion, the Comet was tested to 17 psi., or two to one over operational requirements, before receiving its airworthiness certificate. Fatigue would not show up in a test of this nature.

One way the onset of fatigue failure may have been missed in the case of the Comet was in a subsequent pressurization test. Evidence presented to the court last week was to the effect that cabin integrity under pressurization was only checked to the standard rate of 11 psi. after repairs made in November 1953.

▶ **Clean Bill**—In the first days of the inquiry perhaps more was revealed about what things were not to blame for the Comet crashes than about things that were. For example, in Sir Lionel Heald's opening address these things were given a clean bill of health: the engines, maintenance, tail section strength, pilot and crew, the tower at Rome, ground crews at Rome, the tires (someone earlier suggested one might have blown up), the weather, power controls, pressurization system, and wing strength. The possibility of sabotage was very early effectively ruled out. Comments on Redux bonding and the fuel system have been few, although it is certain they will be exhaustively reviewed as the hearings progresses.

Investigation into the causes of the two Rome crashes began almost immediately after Elba. Invaluable to the researchers was the large amount of wreckage Royal Navy divers were able to recover. All told, they brought up 80% of the aircraft structure, 80% of the powerplants and 50% of the equipment—totaling 70% of the recoverable weight of the aircraft. Aside from the value of these bits and pieces in themselves, the pattern in which they were found on the ocean floor provided important evidence of the order of breakup of the aircraft.

▶ **Wired Skeleton**—A close look at G-ALYP reassembled presents a startling, (and frightening) sight. Under a giant tent at RAE's Farnborough headquarters, every bit and piece that was recovered and could be identified has been hung back in place on specially built frameworks.

Whatever happened to G-ALYP some 35,000 ft. over the Mediterranean was, if nothing else, devastating. The main fuselage all the way from the main wing spar back to the rear pressure

bulkhead seems simply to have disintegrated into pieces a foot or smaller in diameter.

The forward main wing spar just to left of center but still inside the fuselage shows a clean break. The tops and bottoms of the rear main wing spar are buckled—the top one down, the bottom one up—to within inches of one another. Passenger seats are twisted and buckled. The whole empennage is broken off clean with hardly a piece of metal ripped and is pretty much intact. The flight deck forward of the fuselage was torn loose in a perfect circular rip as though it had been done with a dull can opener. Whether tail and flight deck broke loose on impact with the water or during salvage operations hasn't been revealed.

The outer port wing panel has never been found though the very tip was recovered. Great, massive hunks of skin, three to four feet in diameter, were ripped loose from both upper and lower wing surfaces.

The wing spars, except for the missing port outer wing panel and the failure amidships are fairly much intact although considerably twisted and bent. The port inboard engine's turbine wheel is still missing. Its stator blades are badly scarred and chipped. The stator blade ring of the port outboard engine is badly buckled. Aside from the one missing turbine wheel and magnesium parts dissolved by the sea water most of the engines were recovered.

▶**No Word About Redux**—The reaction of Redux-bonded stringers in both the wings and the fuselage will undoubtedly provide some interesting evidence of the reliability of this kind of construction under extreme conditions.

Aero Research, Ltd., which developed the Redux process, apparently expects some comment, either from the Crown or other counsels, because it has legal representation at the hearing. So have the Dunlop Rubber Co., British Thomson-Houston, South African Airways, de Havilland, British Airline Pilots Assn., navigating and engineering officers union, relatives of the victims, and interested government agencies.

The intensive recovery of wreckage in this, the first examinable instance of inflight failure of the pressurized cabin, may also provide some interesting knowledge on riveting techniques. In the small pieces of fuselage recovered from the breakup of the main passenger section were a great variety of failures.

The pressure bulkhead at the after end of the cabin was torn partially loose from its fuselage mounting ring and had about an 18-in. radial rip in the lower port quarter looking forward.

▶**Wreckage and Models**—Having so much wreckage to examine was of course a great help to the investigators. For example, by checking the control cables they were able to decide that the rear fuselage pulled loose before the nose section. By matching together two pieces of metal—one severely burned, the other showing no evidence of burning—they were able to decide that the fire occurred after the breakup and not before. In this way they were able to reconstruct the actual sequence of events. And when they designed ½-scale dynamic models to fall apart in the deduced order and fired them off a hangar top at Farnborough they were able to duplicate on the landing field the wreckage pattern found in the Mediterranean. These models, which were scaled down not only in size but in density and launching speed as well to carefully duplicate the actual Comet in flight, were fired horizontally from a special hangar top track at 90 feet per second and were also dropped from balloons. Where possible they were caught in nets, but quite a few were lost anyhow. Where successive disintegration was required, strings were attached to the various parts to be pulled loose—timing and sequence of the breakup being preset by the string lengths. One end of the strings was attached to the launching site. Movies were taken of these tests.

▶**Pressure Tests in Tank**—For the special static tests run on the Comet fuselage a tank 112 ft long, 20 ft. wide and 16 ft. high, containing 250,000 gal. of water was built out of bolted-together four-foot steel panels. The whole job of designing and building this unit took six weeks.

The fuselage was moved into place when the tank was only partly built. The rest of the tank was then built around the Comet. The wings outboard of the engines stuck out of the tank. Under each wing were four hydraulic jacks which provided positive-G wing bending effects while simultaneously water was pumped into the submerged hull to simulate pressurization.

Drawbacks of the Farnborough rig were that it was not set up to apply negative-G gusts and didn't duplicate the constant small pressure fluctuations an actual aircraft in flight experiences as a result of the control system.

On walking through the fuselage drained of water you can see several places obviously ruptured. This fuselage was tested to destruction several times, repairs being made after each blowout. Near the end, all windows were blocked off and the area around them heavily reinforced with riveted-on heavy aluminum alloy. Tests were then run to see where, if the windows were eliminated, the fuselage would go next.

On another Comet, fueling tests were run to check the effects of overfueling and the results of the accumulation of excessive pressure. One tank was ruptured intentionally and the wing and controls checked for aerodynamic characteristics and strength. Nothing has come out yet on the findings in this case.

▶**Seventy Flight Tests**—In the flight test program, RAE made 70 full-fledged flight tests with aircraft rigged with over 100 different sets of special instrumentation: strain gages to every conceivable part of the aircraft to record high-frequency vibrations, including engine efflux, semi-low-frequency vibrations from other sources such as buffetting, standard flight loads and the like. The aircraft also was wired to record temperatures in every part of the plane, to detect and record fuel leakage, the response of both the pilot and the plane in flight. Everything checked in the air was checked again on the ground. All flights were made unpressurized.

▶**Builder's Worry**—Where all this leaves the people who made and those who bought the Comet is a moot question. De Havilland is trying to come out as best it can and has hired ex-Attorney General Sir Hartley Shawcross to represent it at the court of inquiry.

BOAC, of course, is present but apparently more in defense of its own interests as operator of the ill-fated planes than as a complainant against de Havilland. Air France isn't present.

Question of compensation to the airlines who bought Comets doesn't seem to be near the stage of litigation. It is reported that all Air France wants is a reasonable trade-in value on the Comets it already has bought.

It is a moot point whether Comet 1 will ever fly again commercially.

24,500-Ft. Mark

Sikorsky Aircraft's turbine-powered XH-39 helicopter last week set its second unofficial world record by flying to an altitude of 24,500 ft. at Bridgeport, Conn.

In late August, the same aircraft set a world speed record of 156.005 mph. (Aviation Week Sept. 6, p. 16).

Both records were set by Army warrant officer Billy Western and exceeded marks made last year by Air Force Capt. Russell M. Dobyns, who set records of 146.763 mph. and 22,110 ft. in a Piasecki H-21 Work Horse.

Western's climb at Bridgeport was made under supervision of the National Aeronautic Assn. and will be submitted to Federation Aeronautique Internationale for official recognition.

Rules of the FAI required that Western improve on the Dobyns record by at least 3%. His actual figure for the climb exceeded the old mark by more than 10%. The record was set Oct. 17.

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- ☐ Instant multiple runway coverage at the turn of a switch. Both antennas rotate electrically through 360°. No need to go out to the field to realign the entire equipment. Surveillance antenna tilt through 10° is also controlled remotely.
- ☐ Operates on 50 or 60 cycle power. Sets up, ready to operate within 2 hours.
- ☐ 20 mile range on final approach. Operator can switch, in seconds, to 10 mile display as aircraft comes in.
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Only the Gilfillan GCA Quadradar can bring the known reliability of components already proven under most adverse conditions in world-wide service. Built by the company with by far the greatest experience—builders of 500 GCA equipments.

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LOS ANGELES

F-94 Crash Protests Close Boston Runway

A runway at Boston-Logan International Airport has been closed following the crash of an Air National Guard jet interceptor near homes adjoining the field. The plane apparently lost power while taking off on an alert to check on an unidentified aircraft in the area.

The pilot was killed when he unsuccessfully attempted to ditch his Lockheed F-94 in a channel of water that separates the field from a residential area. Instead, the plane skidded up the bank onto a bordering roadway and halted near two homes, where it burst into flames and scared the dwellings.

The State Airport Management Board, acting on protests by civic leaders and elected officials, shut down Runway 41 for takeoffs and 22R for landings—except for military aircraft "in the event of a national emergency."

Harvard Offers New Air Medicine Course

A graduate course in aviation medicine is being offered this year at the Harvard School of Public Health, Cambridge, Mass.

Dr. Ross A. McFarland, associate professor of industrial hygiene and author of two books on human factors in air transportation and air transport design, will direct the training program.

Seminars during the four-quarter course will include discussions of practical human problems in high-altitude operations, ventilation, temperature, humidity, control of insects and airborne diseases, noxious gases, noise, vibration, acceleration and motion, cockpit and control cabins and passenger accommodations.

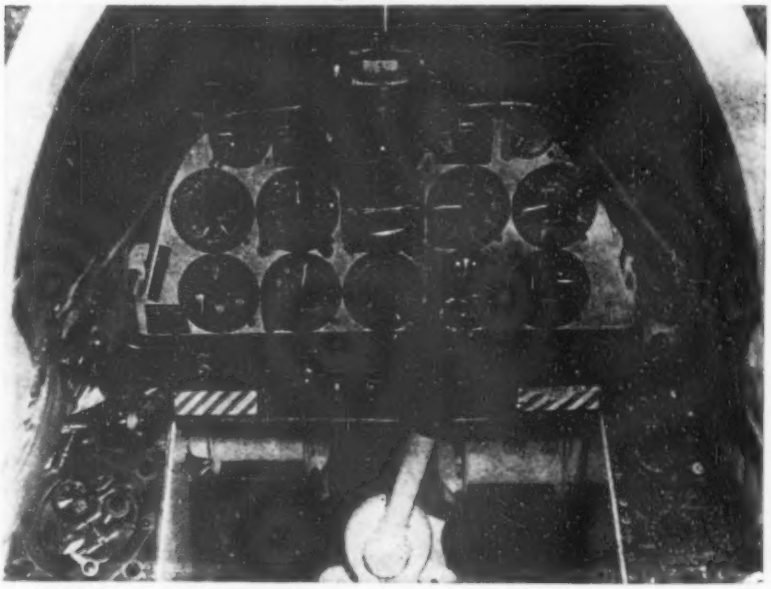
Airport Group Weighs Federal-Aid Program

A special seven-man group of Airport executives has been appointed by the Commerce Department to assist Undersecretary for Transportation Robert B. Murray, Jr., in evaluating the 1955 Federal-aid airport program.

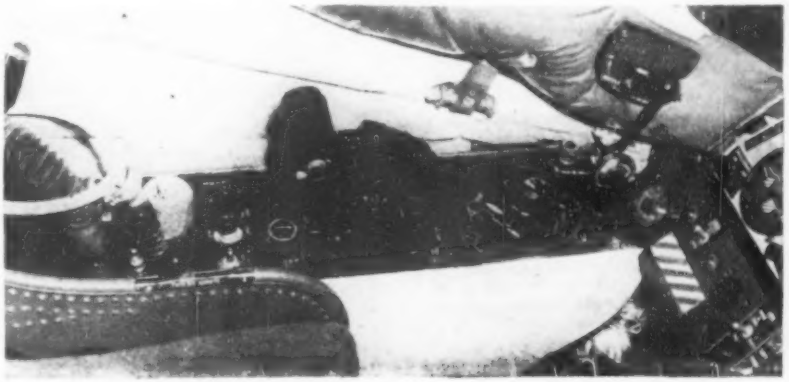
The group will look over the fiscal 1955 program and suggest ways the Commerce Department might improve preparation and administration of the 1956 program.

Members are: Claude Friday, president of the National Association of State Aviation Officials, Albany, N. Y.; Donald Martin, airport manager, Metropolitan Oakland International Airport, Oakland, Calif.; Fred Glass, director of aviation for the Port of New

First Look Inside Lightweight A4D Cockpit . . .



INSTRUMENT PANEL has large, easy-to-read dials. Armament controls are set below the dials. Landing gear lever (left) is shaped like wheel for easy identification. Trim controls sit atop pistol-grip stick, are actuated by pressing button in the center.



LEFT CONSOLE contains engine controls and oxygen regulator. Flap actuator (with airfoil shape) is behind the throttle, which also contains the speed-brake actuator.

RIGHT CONSOLE carries IFF, UHF and instrument lights controls, air conditioning and compass controller. Carrier deck arresting lever is at upper left. Tidy cockpit typifies weight-saving ideas that Douglas-El Segundo put into new Navy attack plane.

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LOW PRESSURE
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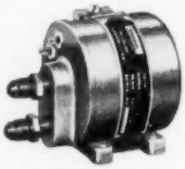
Giannini low pressure transmitters utilize a precision potentiometer element to translate pressure signals into proportional electrical signals (20-50 volts), requiring little or no amplification.



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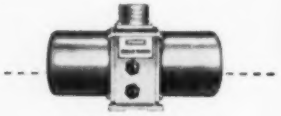
Models are available with single or multiple outputs, and can be linear with airspeed, altitude, pressure, or to natural or empirical functions.

Ranges from ±0.5 psi., dif. to 0-150 psi., (abs., diff., gage), under normal environmental conditions, or extreme conditions of high acceleration, severe shock or vibration. Write for complete engineering information.



MODEL 45177

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York Authority, New York; William Fuller, director of aviation, Meacham Field, Ft. Worth, Tex., and president, American Association of Airport Executives; Louis R. Inwood, director of aviation, Philadelphia International Airport, Philadelphia; Walter Betsworth, manager of Waterloo Municipal Airport, Waterloo, Iowa, and Melvin H. Nuss, director of Reading Municipal Airport, Reading, Pa.

SEC Reports Aircraft Stock Transactions

Mundy I. Peale, president and director of Republic Aviation Corp., has sold 1,000 shares of the company's common stock, reducing his holding to 4,082 shares, the Security & Exchange Commission reports.

Other transactions for the mid-August to mid-September period include:

ACF-Brill Motors Co. Acquisition of 1,000 common shares through exercise of an option, by William Nelson, officer, making a total holding of 5,000 shares; acquisition of 2,500 common shares by Joseph Towne, officer, his total holding.

Air Associates. Disposal of 600 preferred shares, total holding, by C. Kenneth Baxter, director.

Air Reduction Co. Disposal of 100 preferred shares by Charles Munson, director, his total holding.

Allegheny Airlines. Acquisition of 2,000 common shares by Willard Rockwell, Jr., director, making a total holding of 5,000; acquisition of 1,000 common shares by Henry Satterwhite, director, making a total holding of 10,900.

American Airlines. Acquisition of 100 common shares by R. E. S. Deichler, officer, making a total holding of 550.

Aro Equipment Corp. Acquisition of 3,200 common shares by John Markey, officer and director, making a total holding of 106,325 shares.

Bellanca Aircraft Corp. Disposal of 500 common shares, total holding, by James Sullivan, director.

Capital Airlines. Acquisition of 200 common shares by J. D. Stetson Coleman, director, making a total holding of 5,200; acquisition of 1,000 common shares by Thomas Neelands, Jr., director, making a total holding of 5,000.

Continental Air Lines. Direct acquisition of 5,300 common shares by Lawrence C. Ames, director, and indirect acquisition of 400 common shares through the C. H. Ames estate and family, making a total direct holding of 17,000 shares and an indirect holding of 1,900.

Douglas Aircraft Co. Acquisition of 10,000 common shares through exercise of an option by Donald Wills Douglas, officer and director, making a total holding of 15,400.

Fairchild Engine & Airplane Corp. Acquisition of 2,500 common shares by Grover Loening, director, making a total holding of 12,500.

Flying Tiger Line. Disposal of debentures, valued at $81,000, by James Davidson, director, leaving a holding valued at $6,000.

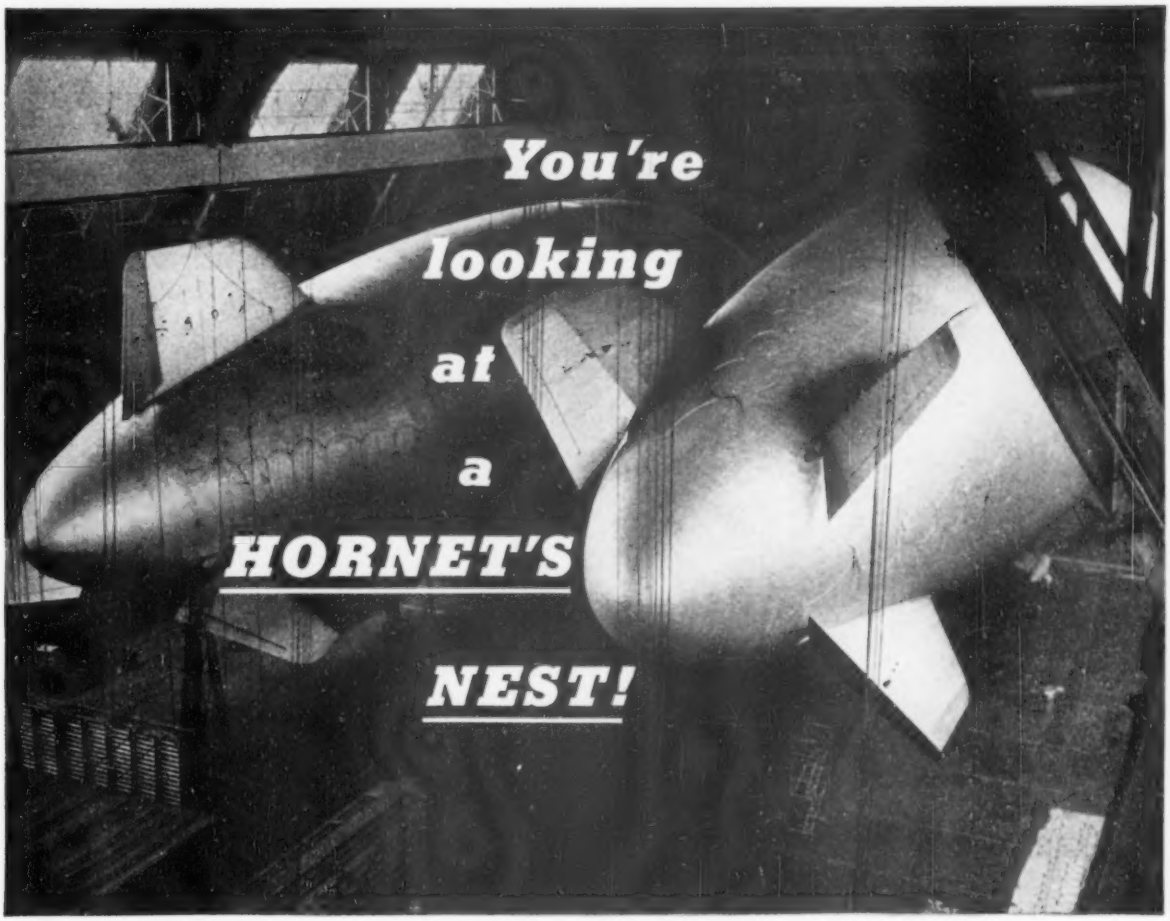
Garrett Corp. Acquisition of 100 common shares by W. R. Ramsaur, officer and director, making a holding of 4,160.

General Dynamics Corp. Acquisition of 2,000 common shares through exercise of an option by Roger I. Harris, officer and director, making a total holding of 2,087; disposal of 1,335 common shares by Clifton Miller, director, leaving a holding of 5,000; disposal of 200 common shares by J. V. Naish, director, leaving a holding of 828; acquisition of 3,000 common shares by Frank Pace, Jr., officer and director, making a holding of 3,115; acquisition of 500 common shares by Lawrence Richardson, officer and director, making a holding of 1,615.

General Electric Co. Acquisition of 1,500

TWA Super Connie With Tiptanks

Wingtip fuel tanks and advanced visual radar equipment will be included in Trans World Airlines' newest Turbo Compound-powered Super Constellations. First of the new planes will be delivered in late February. Tiptanks, with 600-gal. capacity each, are expected to add 600 mi. range with full payload. TWA claims they will be longest range transports available in 1955. RCA-built visual radar will be carried in nose.



AND it's a beehive of activity, too — for at the world-famous Goodyear airship dock, production of lighter-than-air craft is in full swing.

Reason: The versatile airship is being called upon to play a variety of vital roles in our national defense. Armed with the latest in sonar equipment, MAD gear and the latest homing-type weapons — one of the principal roles of the new "super" blimps is that of a swift and deadly submarine hunter.

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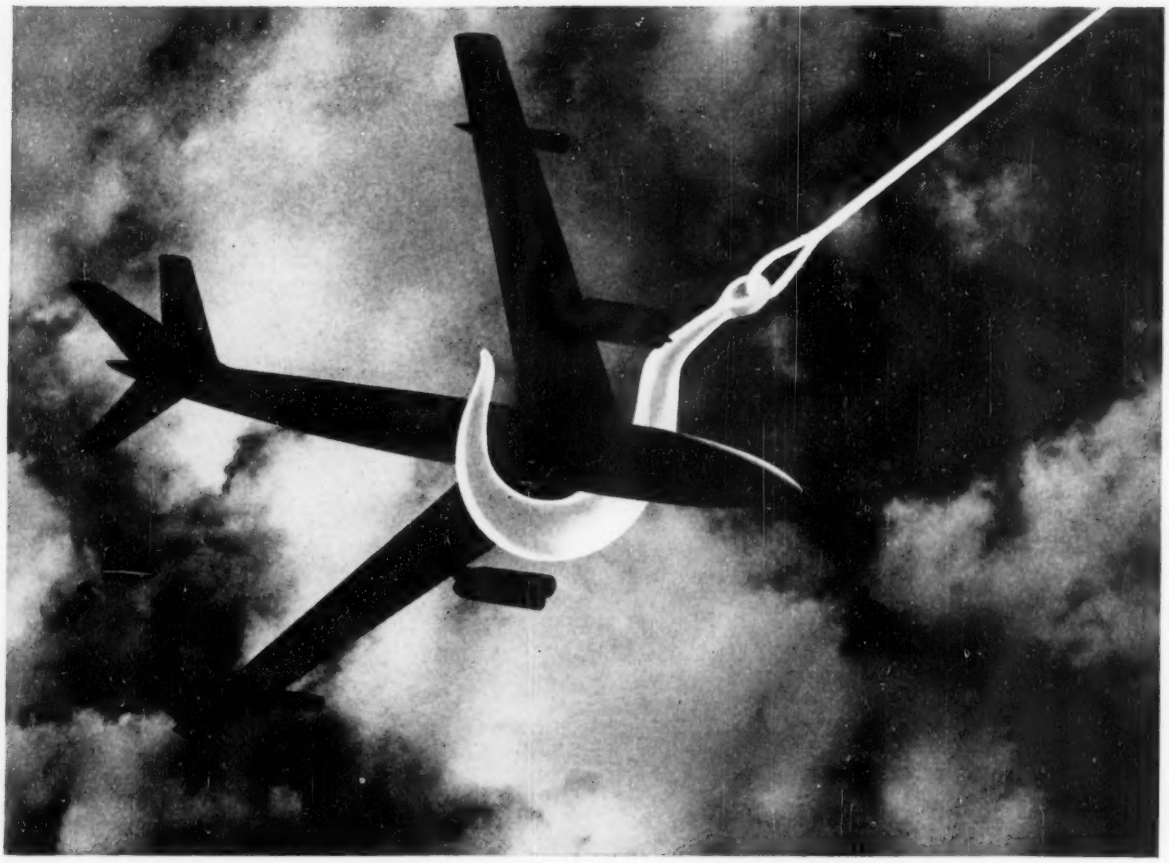

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Because of our work, and that of others, it is now possible for modern aircraft to triple their range and time aloft by using external wing tanks. Still, we are not satisfied. We are currently cooperating with the AMC on the development of in-flight refueling equipment which will permit America's air arm to attain maximum global mobility.

We are proud of this opportunity to further the progress of American aviation through "Operation Skyhook."

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and disposal of 600 common shares by John Belanger, officer, making a total holding of 3,901; acquisition of 200 common shares by George Montgomery, director, making a holding of 800 shares; acquisition of 1,221 common shares by Ross Parker, officer, making a holding of 3,222 shares; acquisition of 1,500 common shares by Robert Paxton, officer, making a total holding of 6,115; acquisition of 1,047 common shares by Ray Turnbull, officer, making a holding of 2,847.

Grumman Aircraft Engineering Corp. Disposal of 1,000 common shares by L. R. Grumman, officer, leaving a holding of 150,300.

Lear, Inc. Disposal of 315 common shares, total holding, by Forrest Beamer, officer; disposal of 636 common shares, total holding, by Albus Durham, officer; disposal of 902 common shares by Paul Moore, officer, leaving 10; disposal of 346 common shares, total holding, by George Otis, officer.

Lockheed Aircraft Corp. Disposal of 455 capital shares by H. R. Campbell, officer, leaving a holding of 3,000; disposal of 500 capital shares by Daniel Haughton, officer, leaving a holding of 2,114; disposal of 200 capital shares by K. V. Sampson, officer, leaving a holding of 1,532.

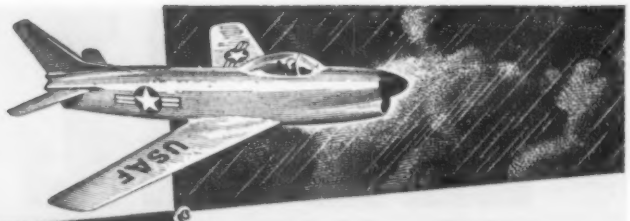
Glenn L. Martin Co. Disposal of 1,400 common shares by Glenn L. Martin, leaving a holding of 273,700; indirect acquisition through wife's estate of 1,000 common shares by Duncan M. Spencer, director, making a total indirect holding of 2,500. Acquisitions of common shares through exercises of options: 1,250 shares by W. L. Lucas, officer, making a total holding of 1,350; 7,000 shares by George B. Shaw, officer, making a holding of 7,380; 3,500 shares by Daniel Siemon, officer, his total holding; 3,500 shares by Earl Uhlig, officer, making a total holding of 3,622; 5,000 shares by George Willey, officer, making a total holding of 7,312.

McDonnell Aircraft Corp. Acquisition of 400 common shares by Garrett Covington, officer, making a total holding of 350.

Northrop Aircraft. Acquisition of 100 common shares, total holding, by James Allen, director. Acquisitions of common

Record Breakers Part

Standing before the Bell X-1A rocket-powered research plane in which they set speed and altitude records, Maj. Charles E. Yeager (left) and Maj. Arthur Murray say goodby before Yeager's departure on a new assignment. He left the USAF flight test section at Edwards AFB for 12th AF Headquarters in Germany. Yeager flew the X-1A at 1,650 mph. last December; Murray piloted the craft to approximately 90,000 feet. Both men wear T-1 pressurized altitude suits.



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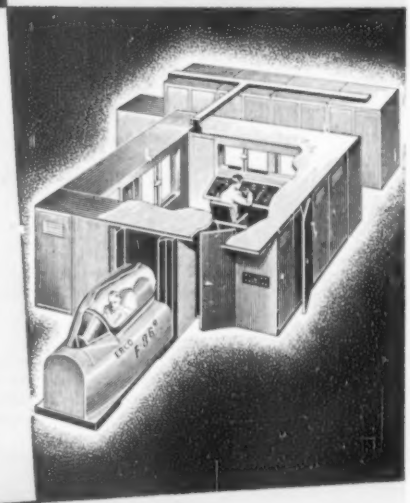

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DIVISION OF GENERAL METALS CORPORATION • BURBANK, CALIF. • HUNTINGTON, W. VA.

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stock through exercises of options: 1,139 shares by Kenneth Bowen, officer, making a holding of 1,330; acquisition of 411 shares, total holding, by George Johnson, officer; 660 shares, total holding, by Edgar Schmued, officer.

Northwest Airlines. Acquisition of 300 common shares by William Stern, director, making a total holding of 2,000; acquisition of 200 common shares by Wheelock Whitney, director, making a total direct holding of 500 shares and 700 indirectly owned shares.

Pan American World Airways. Acquisition of 418 capital shares by Henry Berke, officer, making a total holding of 853; disposal of 535 capital shares by Andre Priester, officer, leaving a holding of 4,351.

Raytheon Manufacturing Co. Acquisition of 3,500 common shares by C. F. Adams, Jr., officer and director, making a holding of 11,000.

Reynolds Metals Co. Acquisition of 400 common shares by Calvin Coghill, officer, making a total holding of 1,205.

Rheem Manufacturing Co. Acquisition of 500 common shares, total holding, by A. C. Welemeyer, officer and director.

Seaboard & Western Airlines. Disposal of 600 common shares by Arthur Dorden, officer and director, leaving a holding of 78,021; disposal of 200 common shares by Charles Ripley, director, leaving a holding of 23,500.

Solar Aircraft Co. Acquisition of 150 common shares, total holding, by D. J. Guth, officer; disposal of 550 common shares, total holding, by Richard Rollins, director.

United Aircraft Corp. Disposal of 200 common shares by H. Mansfield Horner, officer and director, leaving a holding of 4,000; acquisition of 500 common shares by Lauren D. Lyman, officer, making a holding of 1,000.

CAB Lists Business Aircraft Accidents

A compilation by Civil Aeronautics Board of accident statistics covering executive flying from 1950-53 reveals a total of 195 accidents during the four-year period.

Until 1950, executive non-airline statistics were lumped into the personal transportation category. That year a new category was established to account for business aircraft.

The report covers companies owning one or more planes for personnel transportation or for other business and flown by professional pilots.

The 195 total breaks down into 28 fatal and 10 serious accidents plus 157 involving minor or no injuries. The fatal accidents accounted for 98 deaths.

Collision, stalls, airframe failure and propeller accidents to persons on the ground were leading types of serious accidents. Various types of collisions accounted for 23 in the fatal-serious category.

Most major accidents occurred in normal flight. The majority of minor accidents occurred during landing roll.

The most prominent factor involving pilots was the continuation of visual flight rules in unfavorable weather.

On Jan. 1, 1954, investigation of accidents occurring to fixed-wing aircraft under 12,500 lb. was changed from CAB to Civil Aeronautics Administration.

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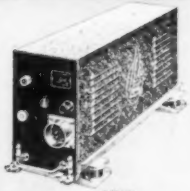

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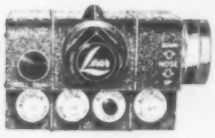

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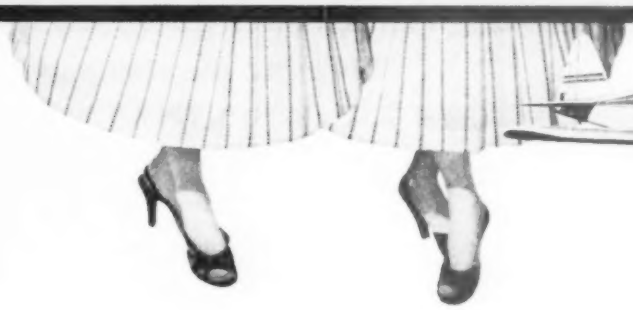

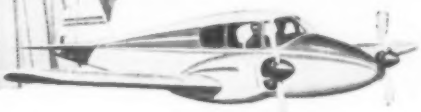

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LC-13

Air Traffic Outpaces L.A. Expansion Plans

Air traffic at Los Angeles International Airport rapidly is outpacing expansion plans, forcing field authorities to consider stop-gap facilities to handle the volume.

The temporary measures would make the "most efficient use" of the present terminal area during the next six years until passenger traffic can be transferred to new facilities, consultants to the Board of Airport Commissioners report.

An economic analysis prepared for the board by Aviation Services Co., Minneapolis consultants, forecasts that by 1960 some 2.4-million passengers will be departing from the airport—twice as many as in 1952. Plane departures will climb to 89,589, and approximately twice the number of employes will be needed to handle the traffic volume.

The proposed stop-gap modernization plan recommends:

- Ten additional plane loading ramps for a total of 36 positions.
- Additions to the existing freight terminal to take care of an estimated 48,500 tons of air cargo, twice 1953's total.
- An increase in public auto parking facilities by at least 1,100 spaces. There now are 1,328 spaces.
- Enlarged kitchen and dining areas in restaurants to handle an estimated 75% increase in business by 1960.

American Asks Delay Of Agency Fee Boost

Postponement of action by Civil Aeronautics Board on an Air Traffic Conference Agency resolution that calls for a revision in compensation rates paid travel agents has been requested by American Airlines.

American proposes that present fees paid to travel agents—5% on point-to-point domestic travel, 7% on international ticket sales and 10% on domestic independent and advertised air tours—be continued pending action by the airline at the next regular meeting at ATC Nov. 15. The amendments filed with CAB were adopted by the conference April 1953.

Principal reason for American's request to rescind the amendments, according to C. R. Speers, senior vice president-sales, is AA's program for sales development and promotion that will be directed primarily at the personal, pleasure and vacation markets.

CAA Sets Up Tower Training on Formosa

An aeronautical training center now is operating in Taipei, Formosa, to train personnel for traffic control and communications work on the Free China system of airways.

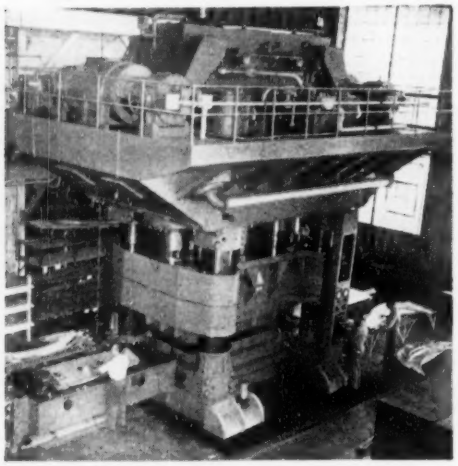
The center is under direction of Civil Aeronautics Administration experts and is operated with the support of Foreign Operations Administration and Nationalist China's Civil Aeronautics Administration. The course lasts 13 weeks, and is patterned after the CAA training center at Oklahoma City.

Brazil International Plans New U.S. Route

Brazilian International Airlines plans to extend its South America-U.S. service from Miami to Chicago as soon as arrangements can be made. Miami now is BIA's only U.S. stop.

Airline officials say the new route would be operated three times a week, flying Douglas DC-4s.

They also report BIA has ordered eight Convair 340s and plans to buy three DC-6s next spring. Two 340s already have been delivered, four more will arrive this month and the last two are scheduled for late 1954.



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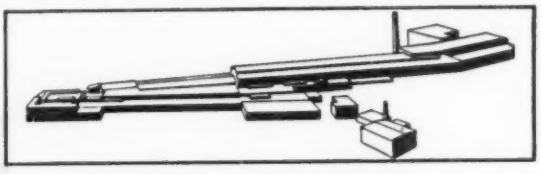

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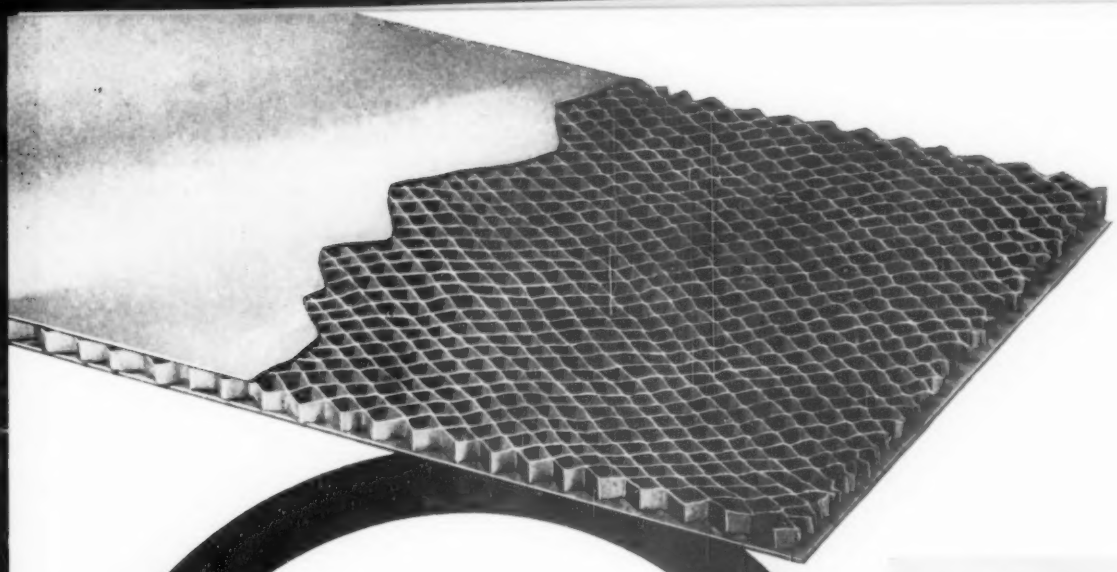

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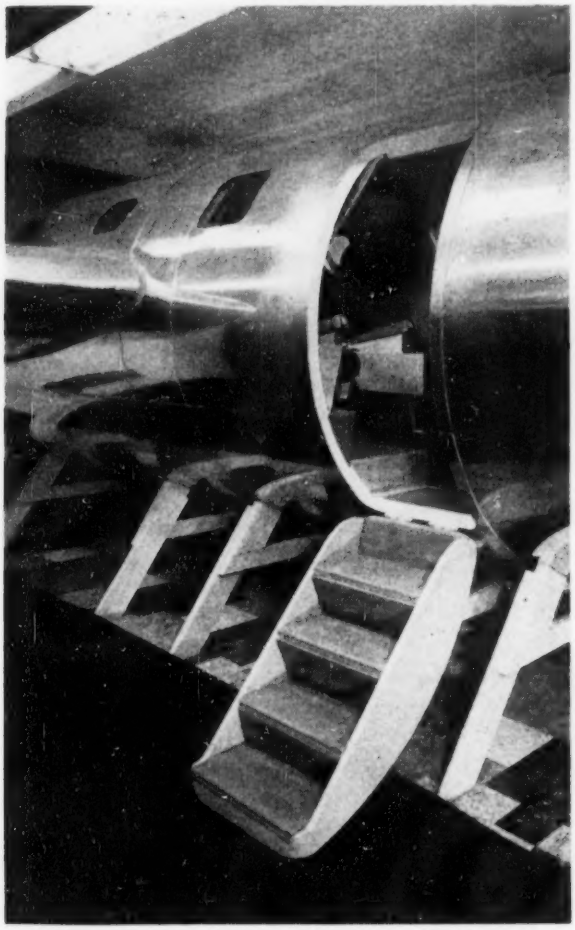
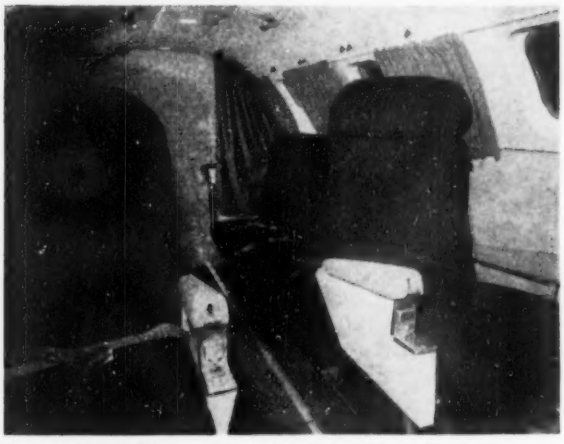


BUILT-IN RAMP for passengers is shown on B-57B mockup.

SIX-PASSENGERS are carried in one suggested version.



EIGHT-PASSENGER mockup includes four-place divan.

Martin Offers B-57B Combat Transport

Glenn L. Martin Co. is trying to interest the Air Force in a "combat transport" version of the twin-jet B-57B, latest of the night intruder series, and is exhibiting a mockup of the plane at USAF bases.

Martin claims the Strategic and Tactical Air Commands have an existing need for such aircraft to conserve travel time for key men.

Other possible uses, Martin claims, would be as a litter carrier, a small tanker, a bomber-navigator trainer, and a cargo plane for transporting high-priority items.

► **Extended Center**—The mockup has the same nose section as the B-57, but the center fuselage section has been extended 2 ft. Diameter of the center section is 78 in.

The cockpit contains tandem seats and dual controls. The pilot is located forward, and the co-pilot's seat is immediately behind and slightly raised. Ejection seats are equipped with identical controls.

An eight-passenger mockup currently is being displayed with four seats and a four-place divan. Martin says this can be changed to a six- or 12-passenger version.

The mockup shows two escape hatches, one in the floor and the other in the roof of the cabin. The cabin entrance door is jettisonable.

The co-pilot's seat can be reached through an entrance from the cabin, permitting passengers to obtain flight time in the plane.

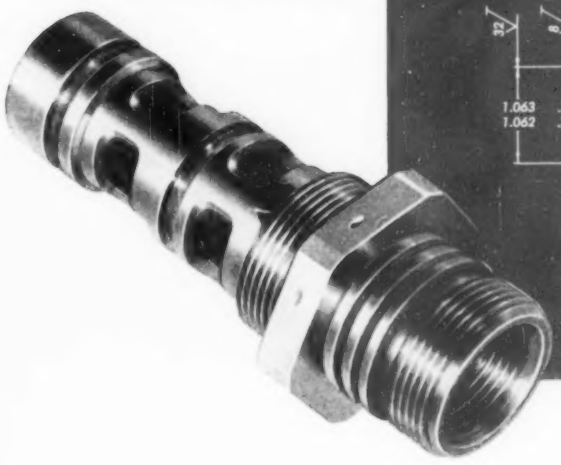
► **12-Month Production**—Martin says the plane could be in production within 12 months after the receipt of an order, and its cost would be comparable to the B-57B when full advantage is taken of the B-57B learning curve.

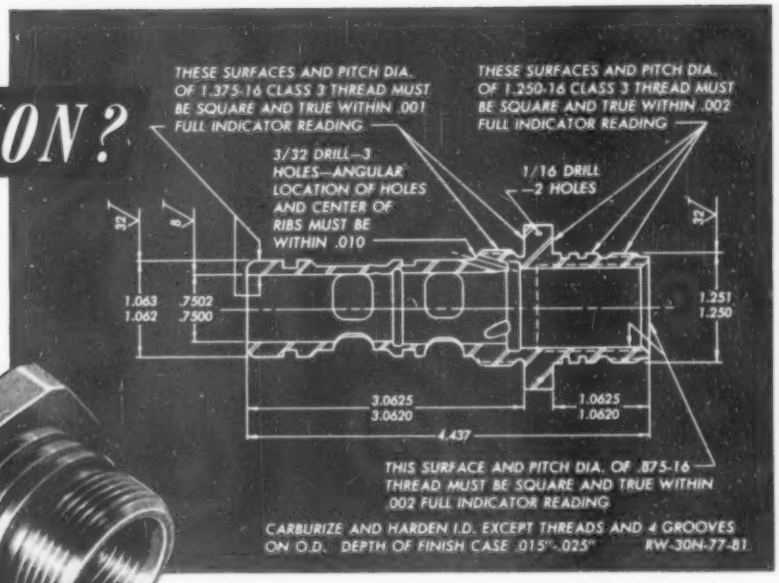
The mockup has been displayed at Washington National Airport, Tactical Air Command headquarters at Langley AFB, Va., and was scheduled to be shown at the National Guard Meeting last week in Miami; Air Materiel Command headquarters in Wright-Patterson AFB, Ohio; Air Defense Command headquarters at Ent AFB, Colo.; Strategic Air Command headquarters at Offutt AFB, Neb., and Air Training Command headquarters at Scott AFB, Ill.

Martin plans to deliver the B-57B to Air Force units within the next few months, and a squadron at Langley AFB (now flying B-26s) will receive the first of the new model.

► **Tight Turns**—O. E. (Pat) Tibbs, director of flight at Martin, put the low-

PRECISION?

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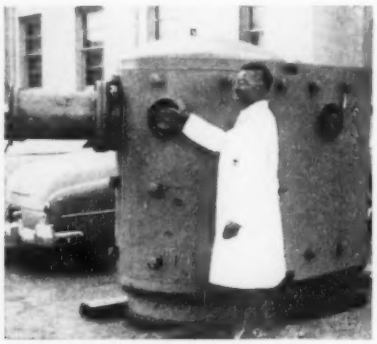
slung aircraft through its paces at Langley in the first public display of the B-57B. The plane showed a high degree of maneuverability as Tibbs executed a turn within a mile radius.

Its speed is in the 600-mph. class, and the plane is powered by two Wright J65 engines—each developing 7,200 lb. thrust.

New design features on the B-57B include triangular speed brakes on both sides of the fuselage, a clamshell canopy for the two-man crew and a redesigned cockpit.

A New York Air National Guard wing is programmed for conversion to the B-57.



GETTING READY for space flight.

Ground-Borne Tank To Aid Space Studies

A sealed cabin, designed to investigate human factors inside the tight cockpit of a space ship, has just been delivered to the Air Force School of Aviation Medicine. Within the cold walls of this heavy steel tank are oxygen equipment, chemical filters to remove excess carbon dioxide and water vapor, and equipment to control the heat.

A joint effort of the School's departments of Physiology and Space Medicine, the sealed-cabin project is under the supervision of Dr. Hans-Georg Clamann, an authority on body functions at high altitudes.

► **The Reasons Why**—A sealed cabin is an essential tool to study high-altitude flight problems because it can furnish information about what goes on inside the aircraft. In contrast, a low-pressure, or altitude chamber, can only tell what happens when things go wrong and the pilot is subjected to outside conditions.

The cabin is hermetically sealed off from the outside air, and furnishes the artificial environment under which the pilot must live. The school says that conventional pressurized cabins of the current type cannot be used above 80,000 ft. There is so little air at that height that present-day compressors cannot pump enough in to keep the flier safe. Ozone is contained in the air

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above 80,000 ft., and is harmful in high concentrations.

▶**What Happens Inside**—A pilot in a sealed container uses up oxygen at about 26 quarts per hour. He exhales carbon dioxide and water vapor, which contaminate the interior atmosphere and raise its humidity. To complicate the issue further, the pilot's body heat raises the temperature.

This explains the need for chemical filters, oxygenation and refrigeration. There is another drawback: Inside pressure must be reasonable, otherwise the stress across the shell becomes a structural hazard in the near-vacuum of extreme altitudes.

For this reason, Clamann is considering a low-pressure environment for the pilot, equivalent to an altitude of about 18,000 ft. At this level, Inca descendants work the mines of the Andes in Peru without difficulty; but Clamann will base his final decision on experiments yet to be conducted.

Bell Establishes New Scholarships

Two full-tuition freshman scholarships have been established by Bell Aircraft Corp., through the Bell Foundation, Inc.

Established in the general fields of engineering or a related science at the University of Buffalo and Canisius College, the scholarships are augmented by an additional grant of $500 to be used either to cover additional expenses incidental to the scholarship recipient, or to give him further assistance.

Scholarship selection will be made by authorities of the two schools on a basis of character, scholarship and financial need. Bell says that all other things being equal, it is requested but not required that the students be selected from either Erie or Niagara counties.

GE Develops New Metal-Ceramic Seal

A new aluminum-to-ceramic joining process developed by General Electric Co. can be used advantageously in the making of capacitors, highspeed relay switches, aircraft instrument panels and ignition systems and other items requiring insulated hermetic seals, the company reports.

The ceramic section is coated with an alloy, and molten aluminum alloyed with the coated ceramic. Resulting dense aluminum layer around the ceramic is machined to the required diameter, then brazed to the aluminum structure for which the ceramic seal was designed. Tests are reported to show the seal capable of withstanding high impact shock, vibration, and corrosion.

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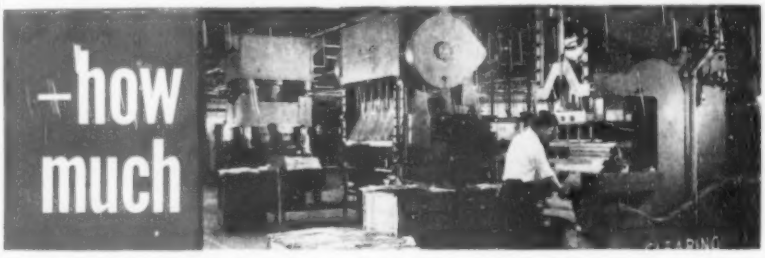

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Report on Rato:

Solid or Liquid: It's Here to Stay

If you want simplicity, solid-propellant type has it: liquid-fuel units give better efficiency, performance.

By Alfred J. Zaehringer

Today the solid-propellant Rato unit stands at a high point in its development cycle; enormous use by the military has helped evolve units which are certified for commercial operation of aircraft.

Liquid-propellant Rato units, although more complex, are currently capable of higher performance; they now threaten the pre-eminence of solid-fuel rockets in booster applications.

This special report for AVIATION WEEK is an assessment of the contemporary status of both types of Rato engines.

▶ **Old and New**—As new as Rato (rocket-assisted takeoff) seems today, remember that the rocket has been employed for several hundred years and that even its use in aircraft is not new.

In 1929 Fritz von Opel in Germany used solid-propellant rockets to boost an aircraft into the air and also to provide propulsion for the first all rocket-propelled aircraft flight. In 1936 a German Heinkel took to the air with a liquid-rocket motor as a takeoff aid.

In the United States, 1941 marked the first aircraft (an Ercoupe) takeoff using solid-propellant motors, done under the aegis of the Army Air Force at March Field, Calif. In 1942, at Muroc, Calif., the first American liquid-fuel Rato motor was successfully flight-tested. During the war and in the years that followed, developments have been rapid and changing.

▶ **Why Rato?**—The advent of the assist-takeoff rocket stems from the fact that an aircraft can sustain a far-heavier load in flight than it possibly can during takeoff. Additional power at takeoff is then one way of decreasing the takeoff distance.

For example, the standard 1,000-lb.-thrust rocket motor can decrease the Douglas DC-3's takeoff distance by about 30%. At sea-level, with an aircraft speed of 60 mph., each 1,000 lb. of thrust adds about 300 brake hp. to the aircraft. For commercial operations, the weight carried is rather stringently restricted for safety purposes. However, for cases where additional loads must be carried (as in military operations), Rato is the ideal (though not necessarily the most economical) way of getting an aircraft into the air.

▶ **Solid-Propellant Rato**—The simplicity of the solid-propellant Rato is its chief virtue. A solid fuel is contained in a steel bottle. A nozzle is used to provide the proper working pressure and to expand the hot exhaust gases to the atmosphere. An igniter (usually a pyrotechnic agent such as black powder) furnishes hot gas and solid particles to impinge on the propellant surface and to ignite it.

Combustion proceeds at a controlled rate, governed by the area of exposed burning propellant surface and the nozzle throat (smallest cross-section) area. The total impulse of the motor—product of thrust and burning time—fixes the amount of propellant to be used. The required time of operation fixes the propellant and nozzle geometry.

To provide relief in event of a large pressure build-up, a safety assembly—essentially a burst diaphragm—is provided.

This type of motor has no moving mechanical parts. One disadvantage is that the thrust cannot be throttled or shut off when desired; the entire wad must be shot.

Present Ratos have excellent reliability and can operate at temperatures ranging from −60F to +160F with little change in performance. The total impulse to powerplant weight ratio is very high and comparable to liquid systems.

Present solid propellants have good specific impulses ranging from 150-200 sec. and are thus a little behind liquids. Specific impulse is the reciprocal of specific fuel consumption.

The early propellants which produced clouds of exhaust smoke are on their way out. The principal component of smokeless propellants is ammonium perchlorate, although cost and availability will restrict its use mainly to military Rato. A growing number of firms (American Rocket Co., Grand Central Aircraft Co., Phillips Petroleum Co., Standard Oil Co. of Indiana, and Thiokol Chemical Corp.) have entered the solid-propellant field with low cost, high-performance solid propellants. However, with all the competition that is shaping up, it is interesting to note that Aerojet-General's Ratos are still the only ones actually being used; and only Aerojet's standard 1,000-lb.-thrust motor has been certified by CAA.

▶ **Liquid-Propellant Rato**—Although much more complex than its solid-fuel counterpart, the liquid-fuel rocket motor is more efficient and is capable of much higher performance. Essentially, there are two systems: the monopropellant and the multipropellant motors.

In the monopropellant system, a liquid such as nitromethane or hydrogen peroxide is injected into a combustion chamber. The monofuel system would be the most ideal type for Rato but, to date, no practical system has been evolved due to the relatively low performance or handling and stability

Alfred J. Zaehringer is president of the American Rocket Co., recently formed for consultation, research, development, production and testing of rocket and jet devices.

His past professional experience includes employment by the Willow Run Research Center of the University of Michigan, Thiokol Chemical Corp. and Grand Central Aircraft Co. in connection with classified military projects in guidance and propulsion of missiles. He has worked on such missiles as the Boeing Bomarc and Hughes Falcon, and has had extensive experience with Rato.

His professional affiliations include membership in the American Rocket Society, American Chemical Society and the American Ordnance Assn.

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American Solid Propellant Rato Motors

Manufacturer	Designation	Propellant	Thrust (lb.)	Duration (sec.)	Length (in.)	Diameter (in.)	Remarks
Aerojet	8AS-200	$KClO_4$ + asphalt-oil	200	8	16¼	6	Development toward 1,000 lb. thrust 14-sec. operation.
"	8AS-500	"	500	8	20	9⅝	"
"	5AS-1000	"	1,000	5	.....	.....	"
"	8AS-1000	"	1,000	8	27¾	9⅝	"
"	14AS-1000	"	1,000	14	35⅝	9⅝	200 lb. loaded, 118 lb. fired. I_{sp} = 165 sec. Smoky exhaust (white).
?	14DS-1000	Double-base	1,000	14	.....	.....	Smoky exhaust (black).
Aerojet	15KS-1000	NH_4ClO_4 +?	1,000	15	.....	.....	Streamlined case. Smokeless exhaust.
?	?	?	4,500	?	.....	.....	45 deg. exhaust nozzle. Used to power rocket sleds.
Aerojet	2.5KS-18,000	NH_4ClO_4 +?	18,000	2.5	.....	.....	Smokeless exhaust. Cost $515 ea.
"	Junior Rato	Aeroplex-K ($KClO_4$ + resin)	250	12	20	7	For light aircraft. In 1949 were scheduled to sell for $150 ea. and $50 for refills.
		Aeroplex-N (NH_4ClO_4 + resin)					

difficulties encountered with present monofuels.

In the multipropellant system an oxidant and fuel react in a combustion chamber. For purposes of repeated operation hypergolic or self-igniting liquids are desired. Examples of hypergolic systems are hydrogen peroxide with a calcium permanganate catalyst, and red fuming nitric acid with aniline. Non-hypergolic system examples are liquid oxygen and alcohol, gasoline and acid.

Most propellant systems today have rather undesirable handling features and many contemplated liquid systems do not seem to offer improvements. Therefore, a compromise must be made between performance and handling. To date, only hydrogen peroxide systems have the necessary balance.

The Germans during the last war used many thousands of the Walter 109-501 Rato employing hydrogen peroxide and achieved a very high level of reliability equivalent to solid propellants. In addition to using low cost materials, the motors and entire systems could be reused.

Liquid-fuel Rato was not much used during the last war by the U.S. because simple liquid systems were not available. However, there now appear to be definite trends toward the use of liquids.

Aerojet has shown a reusable, retractable liquid-propellant installation for the Boeing B-47. In operation of high-speed rocket sleds, the Air Force has found that it can reduce propellant costs to about 1/25 when using liquid propellants in place of solids. The English, also, are finding that liquid operation can be less costly. The Armstrong Siddeley Snarler has been tested on a Hawker fighter; the 215-lb. liquid oxygen-alcohol rocket motor develops 2,000 lb. thrust. De Havilland has the Super Sprite Rato unit using hydrogen peroxide-kerosene or gasoline; maximum thrust of the 600 lb. motor is 4,000 lb. and the operating time is about 40 sec.

Performance of liquid systems is high, ranging from 200 sec. (the upper present solid propellant level) to 250 sec. specific impulse. Another decided advantage of the liquid system is its ability to operate efficiently at low combustion pressures around 300 psi. while most solid fuel motors operate at 1,000-2,000 psi.

► **Future Trends**—Although the performance of the solid-propellant Rato motor is not exceptional, it will continue to be used in large numbers because of its simple operation. Its present high cost, however, will preclude

Facts about *HELI-COIL* inserts in the aircraft industry

What they are

*Heli-Coil** screw thread inserts are precision-formed coils of stainless steel or phosphor bronze wire. Wound into tapped holes, they form permanent non-corrosive, strip-proof threads of astonishing strength.

How they cut weight

Threads tapped in aluminum or magnesium when protected by *Heli-Coil* inserts are much stronger, therefore you can use smaller, fewer, shorter cap screws for required strength. Fewer or shorter cap screws mean savings in fastening-weight, through lighter bosses, thinner flanges, and thinner wall sections.

What they are for

AS ORIGINAL COMPONENTS: *Heli-Coil* inserts are used to provide stronger, lighter fastenings, corrosion-proof, wear-proof, threads in all assemblies. Thus you find *Heli-Coil* inserts throughout aircraft engines, airframes, and accessories, from the heart of jet engines to skin inspection panels.

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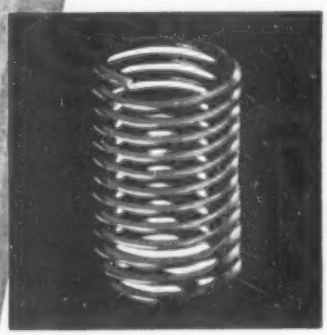

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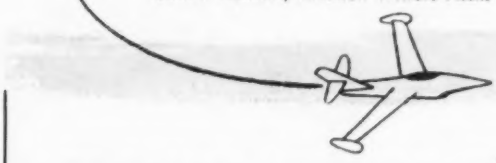


Within the slender, streamlined hull of Nike, the supersonic (ground-to-air) missile, are many vital components, but none more vital than four special units, one about the size of a two-pound coffee can, the other three similar in shape to a pint milk carton.

They're all-important gyros to keep the missile flying true, the large one a stabilizing "free" gyro, the smaller three "rate" gyros, damping out roll, pitch and yaw as the Nike streaks toward its target at an estimated 1500 m.p.h.

Without them Nike could never achieve the amazing intercept ability credited to it, now that the missile has been refined over the years and is going on "active duty" to help guard our nation.

These gyros are the contribution of Schwien Engineering, a company recently purchased by Whittaker, and thus the Southern California aircraft valve concern has entered the gyroscope field.

Before I talked with Nevin Schwien, the gyro genius who founded the company, I knew little about the complexity and "intelligence" of these perfectly balanced whirling wheels. Afterward I realized I knew little more, for Schwien quickly loses the layman in the intricacies of torque, inertia, precession and the laws of gyrodynamics.

Gyros, I found, are basically measuring instruments. They tell you not only what you're doing, but how much. In a turning moment, for instance, the free gyro will tell you how much you've turned and the rate gyro how fast you're turning.

In Nike's case the spinning wheels instantly catch the missile in any flight deviation beyond that necessary for intercept and through electronics direct the control surfaces for immediate correction.

Because the complexities of gyroscopes are far beyond me, it would be absurd to attempt an explanation, no matter how simple. But I can tell you something of Nevin Schwien's history in the field and the problems he has confronted – and solved.

Long ago, when he first became intrigued with gyros, Schwien realized that one day there would be a great demand for instruments utilizing the principle, and that the question was not only how to produce efficiency, but economy as well.

With these twin goals in mind, he produced gyros for Azon and Razon (1943-45), the famed radio-controlled bombs of World War II, and for numbers of other experimental projects. Over the years his design and production skill gained wide recognition.

It was only natural, then, that he was called into conference in 1946 when AT&T, through its subsidiaries, Western Electric (manufacturing) and Bell Telephone (research), undertook the secret Nike project for the Army.

Schwien will tell you that no better choice for a prime contractor could have been made. He points to Western Electric's outstanding record for precision and exactness in operations of the far-flung telephone system, an accomplishment which speaks for itself in electronic know-how and effective maintenance procedures.

Taking his World War II developments as a base, Nevin improved and refined his gyros through a score of new systems each year, channeling his design thinking through almost a complete transition for the Nike units.

There were problems aplenty. In the first place the extremely high G-loading imposed by Nike's acceleration and speed could well have defeated a less determined engineer.

"It is like hitting a gyroscope with a hammer," he commented, adding that today Nike's gyros are tested for a 60-G shock although only 40-G ruggedness is required.

There were problems of torque and lubrication and heat – and related problems of metallurgy and design and production. And always the challenge of keeping the cost within bounds for mass production.

Schwien gives enthusiastic credit to Douglas Aircraft for construction of the bird itself, and the Schwien staff is proud to have shared in this feat with Douglas.

Precision wheels, spinning in space at tremendous speeds, had never been called on for such tough, unerring duty.

But Schwien gyros turned the trick.

extensive usage for commercial applications or applications requiring high thrusts for sustained periods or where thrust control is required.

As complexity is reduced and reliability increased, the liquid Rato system will show definite advantages over solids in applications requiring repeated, low-cost, high-performance operation. It is possible that present rocket developments will allow commercial, built-in installations of liquid Rato systems in the near future. At any rate Rato is here to stay, at least until the space ship.

NACA Reports

► **Investigation of Mach Number Changes Obtained by Discharging High-Pressure Pulse Through Wind Tunnel Operating Supersonically (TN 3258)**—By Rudolph C. Haefeli and Harry Bernstein, Lewis Flight Propulsion Laboratory.

The simulation of flight through a blast or a shock wave can not as yet be done successfully in a windtunnel. But with the use of one of the techniques described in this NACA Technical Note, a supersonic longitudinal-gust tunnel could be made to work and to simulate those special flight conditions.

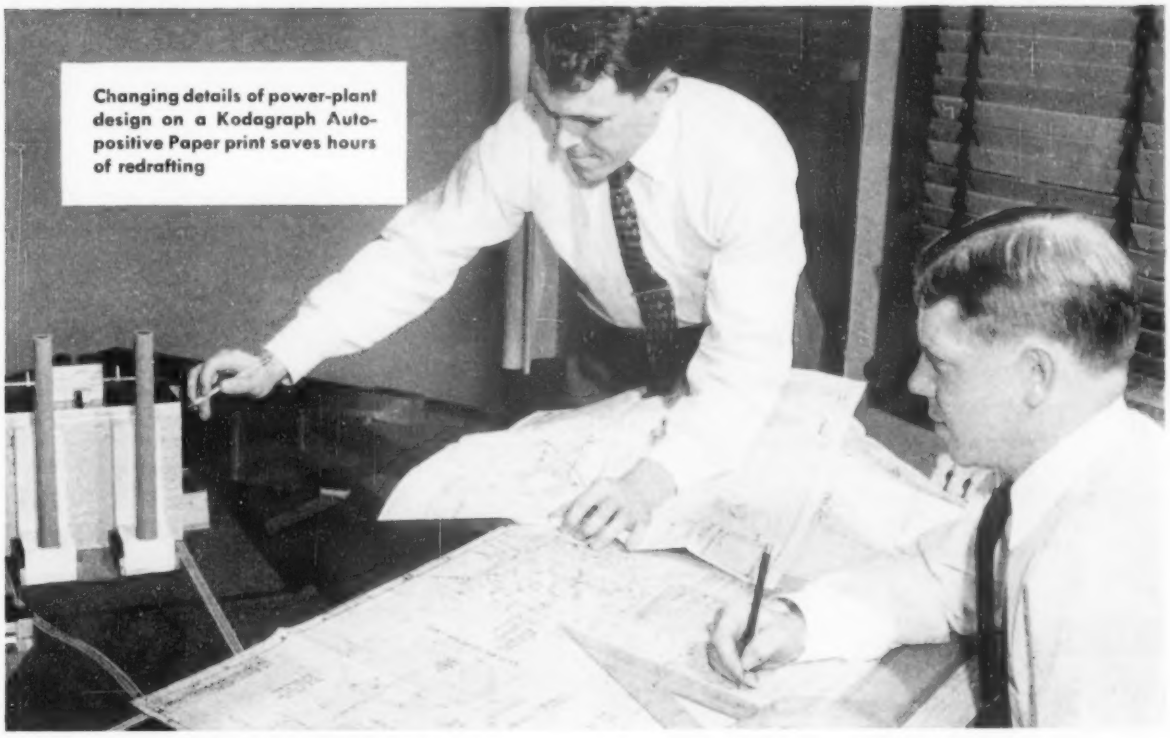
Briefly, these studies are grounded in shock-tube theory, where a shock wave is propagated through a tube by the sudden breaking of a thin bulkhead separating high- and low-pressure chambers. If an analogous procedure is used in a windtunnel, models could be tested experimentally for transient phenomena.

This kind of reasoning led the authors to test a group of different configurations in a small (3.4 x 3.4-in.) duct with two different nozzles for Mach numbers of 1.6 and 1.9 and a "multi-nozzle." Just upstream of the test section, they located a high-pressure chamber of gas, with a sealing bulkhead which could be punctured from outside the tunnel. With air blowing through the duct and test section, the chamber bulkhead was ruptured and the shock wave superimposed on the tunnel flow.

An abrupt rise in Mach number was produced, followed by a less-abrupt decrease toward the initial value.

In the case of the "multi-nozzle," which is as the name implies, a group of many tiny axially-symmetric nozzles formed into a honeycomb, there is a considerable increase in Mach number when the bulkhead is ripped.

Any of the arrangements tested appear to be applicable as a supersonic longitudinal-gust tunnel, say the authors. Final selection would be deter-



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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

mined largely by the desired shape of the curve of Mach number against time.

Determination of the Flying Qualities of the Douglas DC-3 Airplane (TN 3088)—By Arthur Assadourian and John A. Harper, Langley Aeronautical Laboratory.

Why test a DC-3 now? For several reasons: Almost every transport pilot has flown the airplane and knows how it handles, so that a comprehensive quantitative analysis would serve as a good basis for evaluation of present and future transports. Too, the DC-3 is being used as a "dog" ship for such work as autopilot tests by several organizations, and it would help them to have response data for the grand old bird.

Thus this NACA report, 20 years late to be sure, but a thorough and painstaking evaluation of the flight characteristics of an immortal airplane.

Even though the airplane was designed and built long before anybody had defined handling characteristics with any scientific precision, the flight characteristics of the DC-3 satisfied most of the current specs.

Here are the places where it missed:

- **Normal-rated-power, clean configuration**—unstable, stick-fixed, throughout the speed range, and unstable, stick-free, below the trim speed with the CG at its rearward limit. Trimmed at speeds near the normal cruise of 160 mph., stick-fixed stability is almost neutral.
- **Power-approach condition**—unstable, stick-fixed, and slightly unstable, stick-free, at airspeeds below about 115 mph. with CG at its rearward limit.
- **Maximum elevator control-force gradient** of 60 lb./G in maneuvers was exceeded in most cases, especially at small values of acceleration.
- **Rudder forces exceeded the allowable** limit of 180 lb. to overcome adverse yaw developed in rolls out of turns.
- **Rudder and aileron forces in steady sideslips** tended to lighten for angles of sideslip larger than about 10 deg. A few cases of rudder overbalance were found.

▶ **Some Aspects of the Helicopter Noise Problem (TN 3239)**—By Harvey H. Hubbard and Leslie W. Lassiter, Langley Aeronautical Laboratory.

Primary sources of noise in current helicopter designs are the engine and accessories such as gearing, says this report.

The authors have made a general survey of the noise problem, using the viewpoint of an observer on the ground. They consider the nature of the problem, some tentative criteria for evaluating it and the physical charac-

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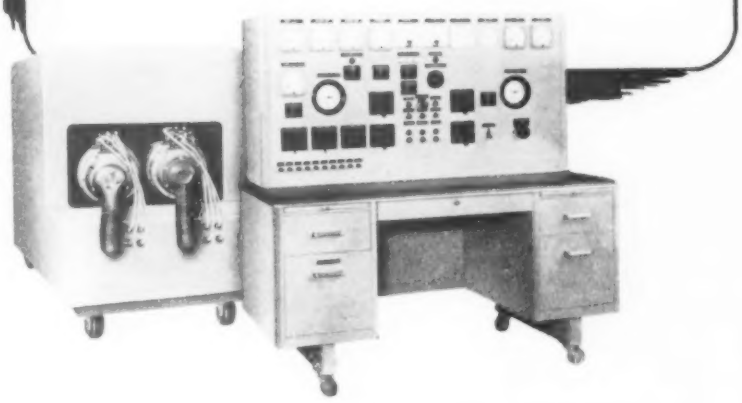

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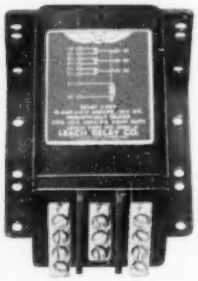

Field-tested Leach Precision Relays like this hermetically-sealed 400 cycle aircraft relay undergo rugged usage and it is essential that the precision schematic lettering remain easy to read and bonded for life to the relay—and Leach has standardized on one method of identification—Metal-Cal—the ultimate in labeling.

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teristics of noise from helicopters.

Most of the report refers to reciprocating-engine copters, although there is some discussion of other types, including those powered by tip jets. For the latter, the authors conclude that noise levels will be considerably higher than for reciprocating-engine types, and that the rotor system may be one of the primary sources of noise.

PRODUCTION BRIEFING

▶ **Mohan, Kamerer & Co., Inc.,** 23 West John St., Hicksville, N. Y., is a new firm offering sales engineering and contract management services to the aviation industry. J. F. Mohan and Charles Kamerer both were formerly associated with Republic Aviation Corp.

▶ **Erico Products, Inc.,** Cleveland 3, Ohio, is offering a molding service for production of fiberglass-reinforced plastic parts in intricate shapes and wide range of colors. Address: 2070 E. 61st Pl.

▶ **Wagner Brothers, Inc.,** maker of metal finishing equipment and supplies, has coordinated all equipment manufacturing facilities in a new plant at 7800 Dix Road, Detroit, Mich.

▶ **Inexpensive oil level gage,** costing only $1.50, saves many man-hours in checking cutting-oil tanks on highspeed routers and drills at Temco Aircraft Corp., Dallas. Previously an oiler had to check the fluid level in 13 tanks by climbing up on a slippery table and peering inside. Now, an upright nine-inch Plexiglas tube is connected to the bottom of each tank by an elbow joint. Oil stands at the same level in the tube as it does in the tank. Now the oiler can readily make a visual check on the tanks as he walks by and refill as necessary.

▶ **Thompson Products, Inc.,** Euclid, Ohio, has taken delivery on a steel test chamber 28 ft. long and 13 ft. in diameter in which temperatures from −100 to 230F can be maintained, as well as altitudes from sea level to 50,000 ft. The device, designed by Ramsey-Bennett Co. and built by Ohio Machine & Boiler Co., Elyria, will be used by Tapco for testing aircraft components.

▶ **Bristol Co.,** Waterbury, Conn., maker of industrial instruments, has been purchased by American Chain & Cable Co., Inc., Bridgeport, for about $7.6 million. Bristol's aviation line includes engine temperature controls, timers, transducers and other electronic and electromagnetic devices.

▶ **American Bridge Division** of U. S. Steel Corp. is fabricating three sections of a large new windtunnel for testing aircraft and missile engines at NACA's Lewis Flight Propulsion Laboratory, Cleveland, Ohio. Well over 125 tons of stainless steel will be used in the throat section of the tunnel.

▶ **Lockheed Aircraft Service-International,** N. Y. International Airport, reports work loads of 466,323 hours for the first half of this year, an 8% increase over the same period last year. During the period recently completed, LASI delivered 617 planes compared with 489 in the first half of 1953, most of it four-engine types.

▶ **Northrop Aircraft, Inc.,** will enlarge its El Segundo, Calif., facility by adding a 198,000-sq. ft. materiel warehouse, boosting its storage area to 278,000 sq. ft. Upon completion of the addition, Northrop employment at El Segundo will rise from present 155 to about 1,200.

▶ **Federal Telephone & Radio Co.,** Clifton, N. J., has organized an instrument division, which will cover communication test equipment, standard capacitors, insulation test equipment and laboratory and industrial electronic testing devices.

▶ **Hexcel Products Co.,** Oakland, Calif., maker of structural honeycomb, has leased an additional 24,000-sq. ft. building at 2398 Fourth St., Berkeley, giving the firm a total 54,000 sq. ft. in its four East Bay structures.

▶ **Cadillac Gage Co.,** Detroit, has taken over manufacturing and sales rights for all products made by Standard Controls, Inc., Seattle. These include hydraulic and pressure-control valves for planes and missiles.

▶ **Temco Aircraft Corp.,** Dallas, has erected a 5,000-ton aircraft press made by Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.

▶ **Com-Air Products, Inc.,** Los Angeles, maker of aircraft hydraulic and pneumatic units, has opened an office at 5886 Rhode Island Ave., Cincinnati, Ohio. Bernard L. Rice is Com-Air's representative at the new office.

▶ **International Nickel Co.'s** Development & Research Division has established four new sections: Constructional Alloy Steels, Electroplating, Inco Nickel Alloys Development and Stainless Steel and Heat-Resistant Alloys.

▶ **Reska Spline Products Co.,** Detroit, is building a new plant to more than double its metal-working capacity.

HHD
HEAT EXCHANGERS

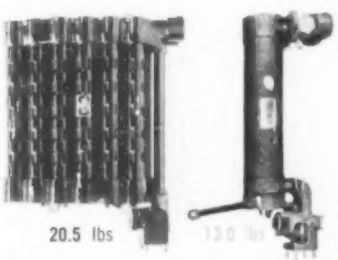
If this symbol appears on the heat exchanger you specify in your installation drawing you know that you are giving the aircraft industry the highest density heat exchanger that has been developed to date.

PERFORMANCE:

MULTI-BARREL, Approx. 175 btu/min. per lb. of weight

SINGLE-BARREL, Approx. 278 btu/min. per lb. of weight

UAP high density heat exchangers are obsoleting even comparatively recent (3 years) heat exchanger designs. Smaller, lighter, cleaner installations for aircraft engine and airframe manufacturers are possible due to the shrunken envelopes with attendant weight savings and the highly concentrated heat dissipating passages.



20.5 lbs 13.0 lbs

DATA IS THE SAME FOR BOTH HEAT EXCHANGERS

STATIC PRESSURES: Oil Circuit 400 psi, fuel circuit 1000 psi.

PRESSURE DROP: Oil Circuit—18 psi at 80 lbs/min at 260°F. using MIL-L-7808.
Fuel Circuit—50 psi at 10,000 pph at 80°F. using JP-4 fuel.

OIL THERMOSTATIC BYPASS: Fully open at 200°F., fully closed at 238°F.

HEAT REJECTION: With oil flow at 80 lb/min, and fuel flow of 39 lbs/min with oil outlet temperature of 250°F. and fuel inlet temperature of 130°F. the cooler will dissipate 3600 BTU/min.

UAP
UNITED AIRCRAFT PRODUCTS
a famous family of aircraft essentials

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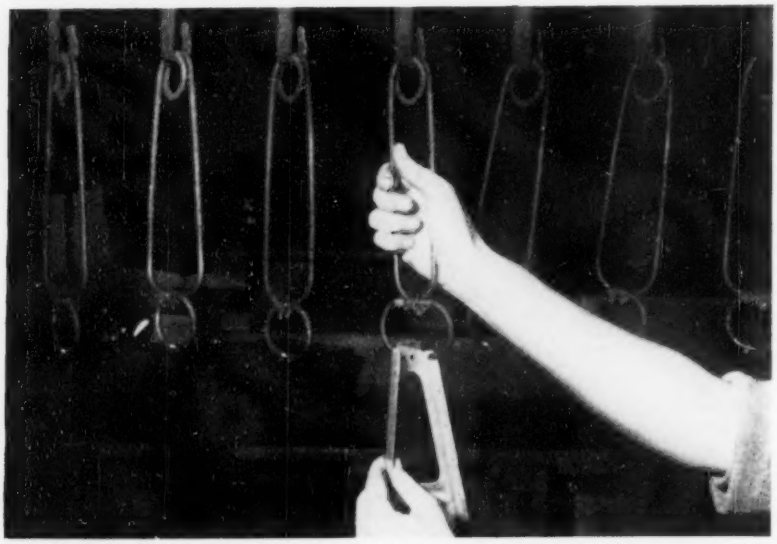
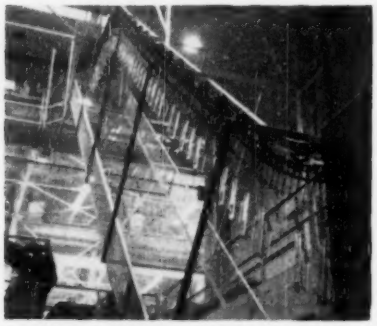
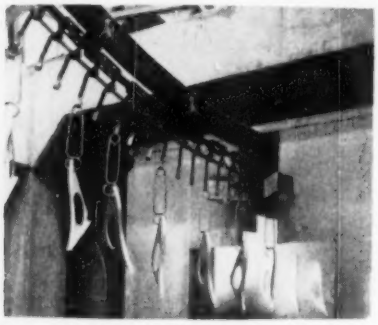
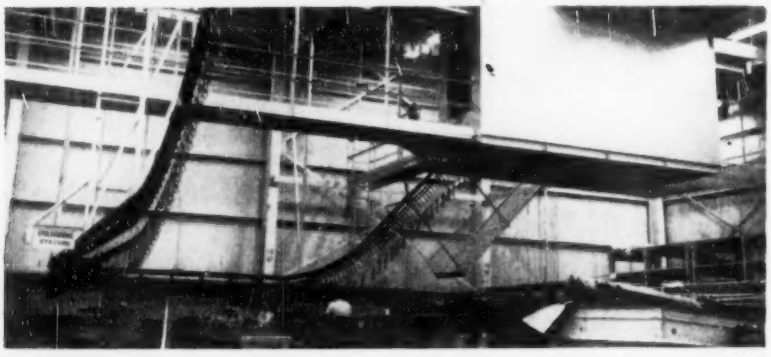


1. **SQUEEZE-HOOK** grips part during 2,100-ft. journey along Douglas flow-paint line.





2. **DOWN GOES CONVEYOR** to 378-ft. underground painting and processing tunnel.



3. **END OF LINE.** Conveyor drops from overhead drying oven for unloading, inspection.

Douglas Paints 6,400 Parts Hourly

New production efficiencies are possible at Douglas Aircraft Co.'s Torrance, Calif., plant following installation of automatic conveyer paint line capable of flow coating accurately 6,400 plane parts an hour.

As part of the company's El Segundo facility, the plant is handling parts for the new F4D Skyray supersonic jet fighter and other Navy planes.

The painting system is capable of taking parts from one square inch up to six feet long. Squeeze-type hooks at four-inch intervals suspend the pieces from the roller chain of the 2,100-ft. long steel monorail. The overhead conveyor dips into five production locations to receive, at a speed of 10-to-30-fpm., the newly formed sheet metal parts. At one point it goes underground into a chambered 378-ft. tunnel where the parts are subjected to a dozen different automatic phases, such as washing, rinsing, drying and various chemical treatments.

A flow-coating method slushes paint on at low pressure from banks of nozzles on the side and bottom of the processing chamber. Uniform quality and thickness of finish is obtained with this system, Douglas says, avoiding paint droop or sag which sometimes results from high-pressure sprays or dipping.

The flow-coater sprays 30-40 gal. of zinc chromate primer during the two eight-hour shifts. Drying ovens maintain 190-deg. heat and shut off automatically whenever the line stops to prevent heat from building up that might come too close to annealing limits.

If a fire should occur, the system stops automatically, all fans and blowers stop, paint flow halts, heat sources are turned off and carbon dioxide is discharged into sumps and all closed drains.

The flow-coat paint system is made by Industrial Systems, Inc., Los Angeles.

Permanent Molds for Centrifugal Castings

A permanent-mold, centrifugal technique is cutting costs for aircraft manufacturers who are using the close-tolerance cast product to replace machined parts.

Known as the Permafuge process, the technique was developed by John Hall of the Wheel Craft Corp., Azusa, Calif., in conjunction with Douglas Aircraft's Long Beach Division chief production engineer Emeric Bergere and chief materials engineer L. O. Curtis.

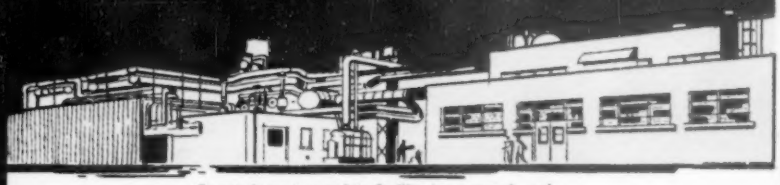
▶ **Savings, Strength**—Douglas reports it has saved about $1½ million in the past two years on forging dies, tooling and machining.

A Northrop castings buyers reveals his company profited by about $50,000 on just one order with Wheel Craft for muzzle doors.

Bergere points out that tests of Permafuge castings show values exceeding the present QQ-A-596 specifications by approximately 25%. However, these higher values cannot be specified until a new spec is written. The ARTC W-70 Casting Quality Improvement Subcommittee of the Aircraft Industries Assn. presently is outlining such a

AIR-TURBINE DRIVES

by *Eclipse-Pioneer*



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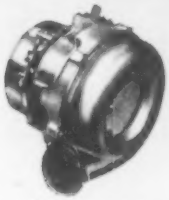
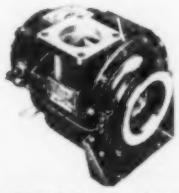
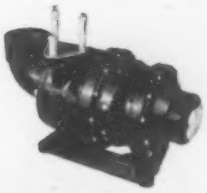
Constant-Speed Turbine-Driven AC Generators



Air-Turbine Starters

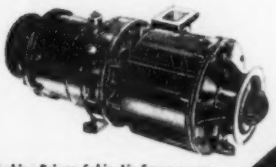


Turbine-Driven Fuel or Water-Alcohol Pumps



Turbine-Driven Ram-Jet Fuel Pumps

plus many other turbine-driven accessories



Turbine-Driven Cabin Air Compressors

Have you considered the advantages of driving your air frame and engine accessories by air?

Compared to other existing drive systems, Eclipse-Pioneer Air-Turbine-Driven units . . . including constant-speed drives . . . cost less and save up to 50% in weight. As desired, they can be supplied for mounting directly on the engine or at some remote location to suit space limitations. Relative simplicity of design permits replacement in minutes, and faster and cheaper overhaul.

E-P's air-turbine program is complete and covers a wide variety of functions, including ram air and engine-bleed, air-driven applications. And even as the most advanced units roll off the production line, research and development continue with vigor . . . investigating the practicability of bleed and burn systems . . . improving on limits of speed control . . . producing greater output in smaller packages.

With close to 40 years of specialized aviation accessory experience, we *know* the accessory business. And because we *know* accessories, we design and build our turbine drives with accessory requirements always firmly in mind.

Whether your requirements call for an accessory with integral air-turbine drive, or an air-turbine drive by itself, E-P can suit your needs precisely. Write today for further information and for illustrated brochure, "Air-Turbine Facility".

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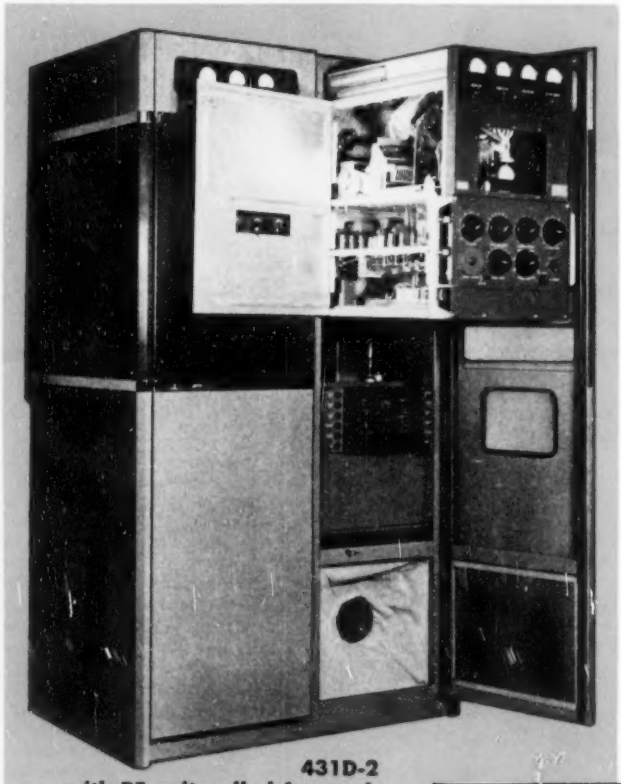
Collins 430

SERIES TRANSMITTERS



431D-2
with RF unit pulled forward.

Building-block assembly permits low-cost custom built HF communications transmitters

A Collins 430 Series transmitter can be tailored to your specific communications requirements — and at low cost. Various combinations of well-designed mass produced Collins basic units are assembled and mounted in one or more cabinets. The Collins method of assembly line production of sub-assemblies results in low manufacturing costs. And, because a great variety of sub-assemblies are produced, many different combinations are possible for *custom installations.*

Developed to fulfill requirements of ground-to-plane, shore-to-ship, and point-to-point transmissions, the 430 Series transmitters are available with modulator and FSK units if desired. Provisions are also made for use of a master oscillator.

Collins' exclusive Autotune makes complete remote control practical. For example, the 431D-2 shown above can be completely controlled at distances up to 25 miles by a telephone dial system.

All 430 Series transmitters use efficient tetrode tubes in modern circuits to give an ideal power-to-size ratio for maximum economy of space.

Here is outstanding equipment, with wide frequency range and high performance, at low cost. Equipment designed to meet your changing requirements economically, too.

Write today for complete description and technical information.

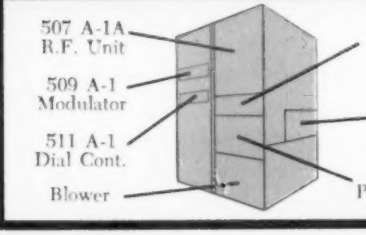
430 Series transmitters Condensed Specifications

Power Output: 431 Series — 1000 watts CW, FSK or phone. 432 Series — 2500 watts CW or FSK, 2000 watts phone.

Frequency Range: 2.0 to 30.0 mc.

Power Source: 208 to 230 volts, single phase, 50/60 cps.

Cabinet Size: Single cabinet, 26" wide x 33" deep x 84" high. Dual cabinet, 48" wide x 33" deep x 84" high.



Line drawing of transmitter frame showing building-block assembly.

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

261 Madison Ave., NEW YORK 16
1930 Hi-Line Drive, DALLAS 2
2700 West Olive Ave., BURBANK
Collins Radio Company of Canada, Ltd., 74 Sparks St., Ottawa, Ontario

COLLINS

specification for approval by the USAF's Materiel Laboratory.

Present development work indicates that by using high purity aluminum alloy ingots with oxide control that 45,000 psi. ultimate tensile strength, 30,000 psi. yield strength, and 8% elongation can be guaranteed in the near future. This compares with 35,000, 22,000 and 3% in the present spec.

►**Grain, Types**—While working to lower physical properties, the Wheel Craft castings are providing weight savings over regular foundry practices through reduced minimum thickness, draft angles and fillets, it is claimed.

Studies at Douglas with X-ray shows that grain appearance is the same as that of a forging in density. Centrifugal pour and setting of the molten material in the heated metal mold has the effect of showing defects, if there are any, on the surface.

Three classes of castings are available: Accurate shape, close tolerance, high integrity, at highest cost; high integrity, low tolerance, at medium cost; commercial quality, low-tolerance, no X-ray or fluorescent inspection, at low cost.

USAF Contracts

Following is a list of recent USAF contracts announced by Air Materiel Command.

AiResearch Manufacturing Co., The Garrett Corp., Los Angeles, Calif., pneumatic starters, 938 ea., spare parts, $2,349,834.

Bendix Products Division, Bendix Aviation Corp., South Bend 20, Ind., main wheel assy., 668 ea., brake assy., 668 ea., 1,864 ea., $2,039,704; wheel assy., 240 ea., brake assy., 240 ea., $99,468.

Boeing Airplane Co., Wichita, Kansas, implementation of production of aircraft at a second source, $5,000,000; facilities for production of aircraft, $4,851,300; $678,000. Seattle, Washington, facilities for production of aircraft, $565,000.

Cline Electric Manufacturing Co., 3405 West 4th St., Chicago, Ill., regulator-magnetic amplifier, 200 ea., 1,000 ea., $493,130.

Convair Division of General Dynamics Corp., San Diego, Calif., facilities for support of aircraft, $174,700.

Crosley Division, Avco Manufacturing Corp., Cincinnati, Ohio, fire control system, spare compartment, spare parts, 68 ea., $5,177,610.

Eclipse-Pioneer Division, Bendix Aviation Corp., Teterboro, N. J., fuel-air combustion starter, 185 ea., $563,325.

General Electric Co., 1 Jimson Rd., Cincinnati 15, Ohio, spare parts, $1,500,000. Dayton, Ohio, generators, aircraft, 100 ea., spare parts 78 ea., $93,427. Schenectady, N. Y., generator, tachometer, 2,160 ea., $64,864.

Goodyear Tire & Rubber Co., Inc., 1144 East Market St., Akron 16, Ohio, wheel assy., 77 ea., 78 ea., brake assy., 76 ea., $171,662.

Guardian Electric Mfg. Co., 1621 West Walnut St., Chicago 12, Ill., switch, control stick, 10,819 ea., $504,812.

Kollsman Instrument Corp., 80-08 45th Ave., Elmhurst, N. Y., indicator; tachometer, 3,145 ea., $257,665.

Lockheed Aircraft Corp., Burbank, Calif., gross weight and center of gravity indicators, 2 ea., $41,357.

Lockheed Aircraft Service International, Inc., New York International Airport, Jamaica 20, N. Y., parts and materials, 9 ea., electronic modernization, 5 ea., $613,261.

North American Aviation, Inc., Los Angeles International Airport, Los Angeles 45, Calif., implementation program, $10,000,000.

Royal Jet, Inc., 1024 Westminister Ave., Alhambra, Calif., 320 gal. jet fuel tank, 350 ea., $144,700; tank assy., 328 ea., $1,860,153.

Seeger Refrigerator Co., 850 Arcade St., St. Paul, Minn., fuel tank-jet, 4,640 ea., $1,242,220.

O. A. Sutton Corp., 1812 West Second St., Wichita, 120 gal. jet fuel tank, 4,640 ea., $1,245,236.

Trans World Airlines, 10 Richards Rd., Kansas City 6, Mo., model of 20 L/649 aircraft, 20 ea., $29,920.

United States Gauge Division, American Machine & Metals, Inc., Sellersville, Pa., transmitter, 1,889 ea., indicator, 788 ea., $260,697.

Viewlex, Inc., 35-01 Queens Blvd., Long Island City 1, N. Y., projector, 676 ea., $93,085.

Western Electric Co., Inc., 180 Broadway, New York 5, N. Y., pulse generators, $245,380.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., indicator-fuel 730 ea., 363 ea., 350 ea., $64,156.

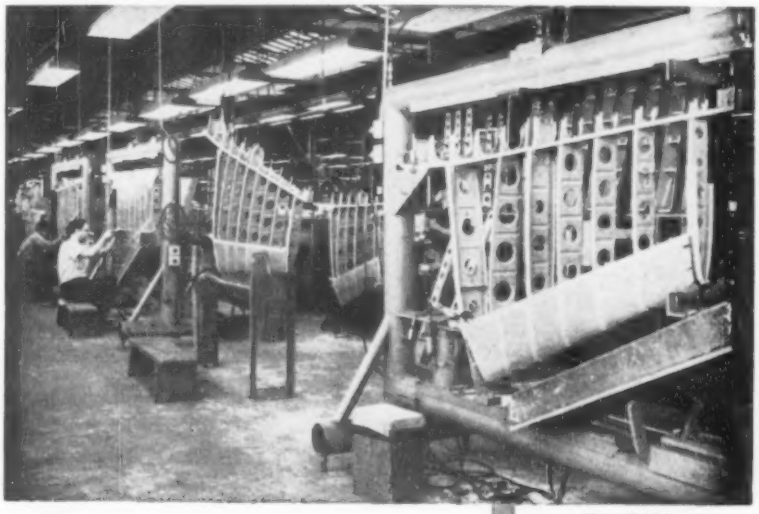
Allison Div., General Motors Corp., Indianapolis 6, modif. and conversion of engine, $715,000; facilities for production of engines, $147,141.

Aircraft Gas Turbine Div., General Electric Co., 1 Jimson Rd., Cincinnati 15, training parts for aircraft engines, $60,000.

C. T. M. Co., Inc., 10 Howard St., Buffalo 6, N. Y., rack-bomb spare parts, 95 ea., 182 ea., $69,933.

Convair, San Diego, Calif., fuel tank study program for aircraft, $47,699.

Dorsey Trailers, Elba, Ala., semi-trailer, van type, spare parts and maintenance data, 51 ea., $553,634.



Above F-84 fins and rudders by EDO

A FEW EXAMPLES OF EDO CRAFTSMANSHIP

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USAF A-3 airborne lifeboat

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Electronic Cabinet

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EDO Means *Design*, Too. Water plays no favors. Water leaks through any structure not precisely built. That's why making seaplane floats for 27 years has made precision manufacture of aluminum components a specialty at EDO.

Because of this unusual metal-working know-how, many manufacturers are turning their hard-to-make parts and sub-assembly problems over to EDO.

What's more, EDO's vast engineering staff, which has designed everything from complete aircraft to the Navy's latest sonar equipment can tackle problems right from the design stage, if desired.

Perhaps EDO can help you.

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ENGINE AND AIRPLANE CORPORATION

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Aircraft Division

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HAGERSTOWN, MARYLAND

Adel Division, General Metals Corp., 10777 Van Owen St., Burbank, Calif., hydraulic valve, 124 ea., $80,273; valve assy. hydraulic, 158 ea., $28,950; valve assy.: hydraulic for various aircraft, $25,031.

Bendix Products Division Bendix Aviation Corp., 401 Bendix Drive, South Bend 20, Ind., engine parts for carburetors, $209,802.

Mitchell Camera Corp., 666 W. Harvard St., Glendale 4, Calif., camera system, aircraft, 8 ea., $87,175.

Raymond Corp., Greene, N. Y., truck, fork lift, electric, 6 ea., $29,538.

Raytheon Mfg. Co., Waltham, Mass., radar set AN/ALT-8, 24 ea., $274,765.

Republic Aviation Corp., Farmingdale, L. I., N. Y., handbooks, $28,165.

Ryan Aeronautical Co., San Diego, Calif., target drones, spare parts, $3,266,190.

Bendix Products Division, Bendix Aviation Corp., South Bend, Ind., engine parts for P&W J57-P-13 engines, $172,806.

Hydra-Power Corp., 10-12 Pine Court, New Rochelle, N. Y., maintenance parts for cylinder, control booster, $108,872.

Lenoir Wood Finishing Co., 284 E. Harper Ave., Lenoir, North Carolina, resin, saran, 18,000 gal., $30,600.

McDonnell Aircraft Corp., P. O. Box 516, St. Louis 3, Mo., maintenance parts for F2H-2P, 3, 4 aircraft, $4,496,991.

Parker Aircraft Co., 5827 W. Century Blvd., Los Angeles 45, Calif., fuel valve assy., 38 ea., $29,056.

The Sherwin Williams Co., 325 N. Broad St., Philadelphia 7, Pa., varnish, 24,000 gal., $43,820.

The following contract awards were recently announced by Gentile Air Force Depot, Dayton:

AiResearch Mfg. Co., 9851-9951 Sepulveda Blvd., Los Angeles 45, switch, thermostat, temp. controlling, 500 ea., $89,050.

Cook Electric Co., 2700 North Southport Ave., Chicago 14, relay, inverter, changeover, 200 ea., $36,220.

Fairchild Camera and Instrument Corp., 225 Park Ave., Hicksville, L. I., N. Y., resistors, potentiometers, variable, wirewound, 391 ea., $45,316.

Laboratory for Electronics, Inc., 75 Pitts St., Boston 14, oscilloscope-cathode ray with 5YP-1 tube, 85 ea., $68,944.

Pacific Scientific Co., 1430 Grande Vista Ave., Los Angeles 23, tensiometer, aircraft control cable, 522 ea., $25,840.

Radio Corp. of America, Tube Div., 415 South Fifth St., Harrison, N. J., tube electron, receiving, pentode, special-purpose, 392,676 ea., $655,768.

Shaw and Estes, 1407 S. Akard St., Dallas, Texas, stand assembly, jet engine test, semi-portable, 55 ea., $1,659,121.

Sprague Engineering and Sales Corp., 1144 West 135th St., Gardena, Calif., stand test, hydraulic system, electric-motor-operated type, 2 lea., $70,888.

Testa Mfg. Co., 418 South Pecan St., Los Angeles 33, tester, optical sight, appl. to A-4 sight, 161 ea., $43,484.

Union Switch and Signal Div., Westinghouse Air Brake Co., 1789 Braddock Ave., Swissvale, Pa., test racks, mobile, 40 ea., $132,600.

United Mfg. Co., 41 Haig St., Hamden, Conn., tester, tachometer field portable, 67 ea., $57,088.

Bird Electronics Corp., 1800 East 38th Street, Cleveland 14, Ohio, RF Wattmeter-Bird Model No. 43 with Element D-25, 286 ea., $26,812.

Navy Contracts

Contracts recently announced by Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11, are:

North American Aviation, Inc., Columbus Division, 4300 E. 5th Ave, Columbus 16, Ohio, maintenance parts for SNJ and AJ aircraft, $34,387.

Pacific Division, Bendix Aviation Corp., 11600 Sherman Way, North Hollywood, Calif., hydraulic valve assy., $77,830.

The Paula Shops, 2574 Coral Way, Miami 45, Fla., tow target, 4,168 ea., $112,536.

Red Bank Div., Bendix Aviation Corp., Eatontown, N. J., alternator exciter control, regulator panel, $187,749; control panel, 314 ea., $52,727.

Telerad Mfg. Corp., 1440 Broadway, New York 18, field strength meter, MIPR, 429 ea., $37,476.

Thompson Products, Inc., 23555 Euclid Ave.,

DEVELOPMENT ENGINEERS

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FOR: Design Engineering, Practical Research, Investigations of Theories, Functional Analysis

An interesting challenge for senior design engineers to work directly with top project supervisors helping through the prototype stage new developments in:

- Automatic Control Instruments
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- Magnetic Amplifiers
- Airborne Armament Systems
- Guided Missile Controls
- Computing Equipment

For these jobs we are interested in men with two or more years experience in electro-mechanical work related to the above fields or in men with superior scholastic records in physics; electrical, electronic or mechanical engineering.

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Our policy of permanency of positions and continuity of service does not allow us to employ engineers unless there is a *clear and definite need for them projected years into the future.* And we promote from within.
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31-10 Thomson Ave., Long Island City, N. Y. (20 minutes from the heart of New York City)

Scale Tells Tale

Portable scale for determining weight distribution and balance of jet turbine "buckets" (blades) is designed to three times accuracy of mechanical indicator types. It accomplishes this by utilizing a frictionless shadow-edge indication and specially designed holder (right, actually an extension of the scale lever). Developed by Exact Scale Weight Co. to General Electric Co.'s order, the device will weigh accurately without being leveled. The firm is located in Columbus, Ohio.

AEROPRODUCTS TURBOPROPS

have more flight time than any other American-made turbopropellers

USAF Convair YC-131C with Aeroproducts Propellers and Allison YT56 Turboprop Engines

Aeroproducts propellers are used by the U. S. Navy and Air Force on aircraft built by Douglas, Convair, and other great names in American aviation.

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The years of pioneering work which Aeroproducts and Allison have done are now paying off in the availability of Turboprop engines and propellers which enable military and commercial aircraft to carry bigger payloads farther, faster and more economically than ever before.

Believing in the future of the gas turbine engine, Aeroproducts began work on propellers for turboprop aircraft over a decade ago. When a small turboprop aircraft was flown for the first time in the United States in 1945, it carried an Aeroproducts turbopropeller. Today, Aeroproducts turbopropellers are America's most widely used because they have proved their quality and stamina on military aircraft and the Allison Turboliner.

Turboprops are just part of Aeroproducts' contribution to safer, more efficient flying. Aeroprops for piston-driven engines, for instance, have long since proved themselves among the industry's finest. And Aeroproducts' hydraulic and pneumatic self-locking actuators provide easy, accurate control of flight surfaces. A new air-driven emergency generator, now available, is another notable development by Aeroproducts.

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1 **TIME-TESTED DESIGN** Part 452008. More than 100,000 Bendix-Pacific LM-108 Geneva-Loc rotary electric actuators have been in use over the past 10 years. Split series 24 V-D.C. or 110 V-A.C. Rated at 2.5 oz. inches intermittent duty to 160° F. Weight 13 oz. Reversible and unirotational with or without integral filter.

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Export Division: Bendix International 205 E. 42nd St., N.Y. 17
Canadian Distributors: Aviation Electric, Ltd., Montreal 9

Cleveland 17, Ohio, pump assys., $49,375.

United States Rubber Co., Fuel Cell Dept., Providence, R. I., bladder assy., 79,552 ea., $191,784.

Willis and Geiger, Inc., 51 W. 21st Street, New York 10, outer garment for Mk-4 suit gloves, rubber sleeve, $375,222; repair kit for anti-exposure suit, 4,414 ea., $62,028; life preserver, 4,712 ea., $71,528.

AiResearch Mfg. Co., div. of The Garrett Corp., 9851-9951 Sepulveda Blvd., Los Angeles 45, Calif., turbine assy., 386 ea., $207,147; maintenance parts used on various fan and separator assys., $58,539.

Champion Spark Plug Co., 900 Upton Ave., Toledo 1, Ohio, spark plugs, 39,000 ea., $46,800.

The B. G. Corp., 136 W. 52nd St., New York, N. Y., spark plugs, 39,000 ea., $45,825.

Stratos Div., Fairchild Engine and Airplane Corp., Bay Shore, L. I., N. Y., services and materials for generator drive assy., and repair parts, 69 ea., and spares, $120,242.

Barber-Colman Co., Rockford, Ill., maintenance parts for various aircraft, $37,321.

Bendix Products Division, Bendix Aviation Corp., 401 Bendix Drive, South Bend 20, Ind., spare parts for P&W J57-P-11 engines, $105,982.

Eclipse-Pioneer Division, Bendix Aviation Corp., Teterboro, N. J., bearings, 40,100 ea., $82,205.

Flexible Tubing Corp., New Whitfield St., Guilford, Conn., flexible tube, $31,909.

General Electric Co., 1405 Locust St., Philadelphia 2, Pa., controller and servomotor and spare parts, $26,060.

G. M. Giannini and Co., Inc., 580 Fifth Ave., New York, N. Y., aerohead transmitter, 25 ea., $32,085.

The Glidden Co., Chemical and Pigment div., 1717 Summer St., Hammond, Ind., pigment, cuprous oxide, 54,000 lb., $26,606.

Hughes Tool Co., Aircraft Division, Culver City, Calif., armament parts, $338,788.

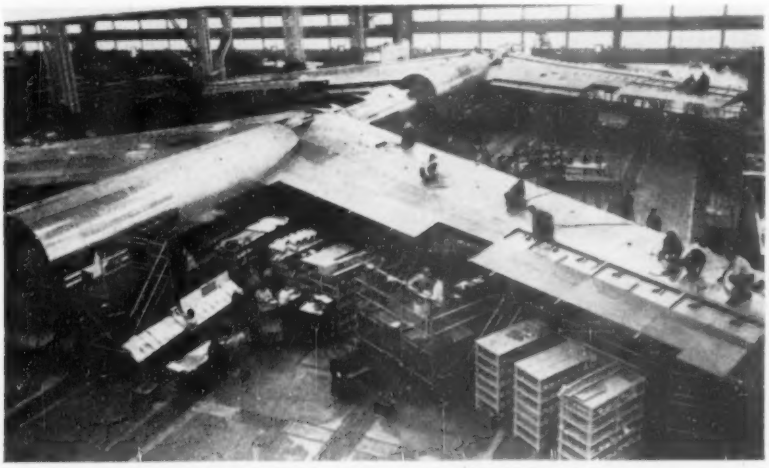
McCulloch Motors Corp., 6101 W. Century Blvd., Los Angeles 45, Calif., launcher and chute assy., 298 ea., $427,652.

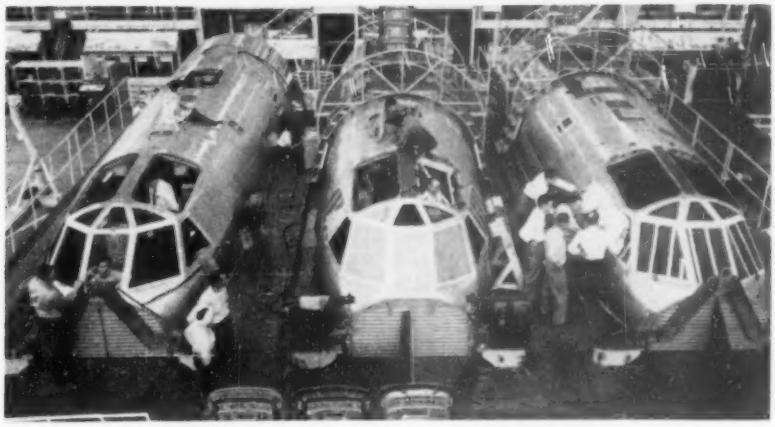
Maine Specialty Co., 98 Exchange St., Portland 3, Maine, connector, wire rope, lifeline turnbuckles, 6,000 ea., $34,680.

Pesco Products Division, Borg-Warner Corp., 24700 N. Miles Rd., Bedford, Ohio, spare parts for Pesco products, $110,075; $34,390.

Wm. B. Whittaker Co. Ltd., 915 North Citrus Ave., Los Angeles 38, Calif., valve assy. for F7U-3, 3P aircraft and spare parts, $67,935.

C. K. Williams and Co., 640 N. 13th St., Easton, Pa., pigment, cuprous oxide, 54,000 lb., $26,606.





B-52 Production Gets Rolling

Production of the big Boeing B-52 Stratofortress eight-jet heavy bomber is making headway at Seattle, Wash., as these photos show. At top, women workers team with men on two of the planes as they near the final assembly area. From here the planes will shift back and be taken to an adjoining bay on the left for completion. Lower view looks down on three Stratofort nose sections being assembled in their two-story jigs, which allow a maximum number of employes to work on the assemblies. First production B-52A rolled out of the factory about six months ago.

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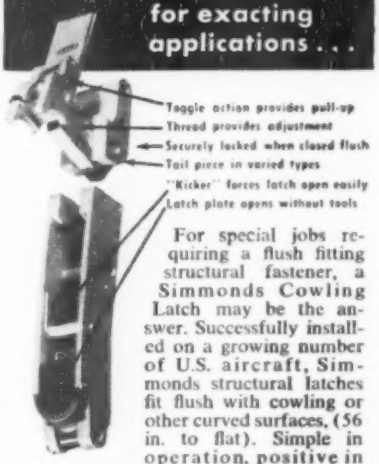
for exacting applications . . .


Toggle action provides pull-up
Thread provides adjustment
Securely locked when closed flush
Tail piece in varied types
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Crosstalk limited to minus 60 Db for adjacent heads. Resonant frequency above 500 KC
Track width: .090 in.
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"24 ACCIDENT-FREE YEARS...7 ON AIRWORK-OVERHAULED R-2000's!"

Writes Branch T. Dykes, President
Colonial Airlines

In a recent letter of commendation, Colonial Airlines attributed part of the credit for their world's safety record to performance of their Airwork overhauled R-2000's. Airwork quality paid off in maintenance savings, too. During the 7 years Airwork has overhauled these R-2000's, operating time between overhauls increased from 900 hours to 1400 hours without lowering Colonial's impressively high standards.

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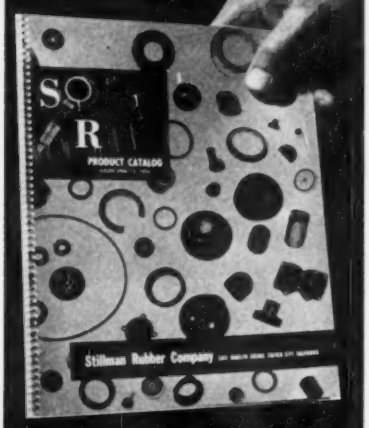

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OVERSEAS SPOTLIGHT

Reds Add Radar Link

VIENNA

Soviet forces in Austria have added a new link to the chain of radar stations stretching from the Baltic to the Black Sea. Most Soviet radar units in Austria are small and mobile, but in completing their radar warning system in the Soviet Zone here, they have equipped the bases at Wiener Neustadt and Bad Voeslau, both in lower Austria, with permanent radar installations.

Copter Field Upstairs

OSLO

The first helicopter landing platform to be built in Scandinavia will be constructed soon on the roof of a 12-story office building here in Oslo.

The landing platform will be 4,500 sq. ft., and will be built above the building's regular roof, clear of chimney, smokestacks and similar obstructions.

Millions for Airfields

MELBOURNE

The Australian government will spend 5 million pounds (the Australian pound is worth $2.24) this year in construction of strategically placed airfields. The new fields are designed to enable the air force to meet any threat to the Australian coast or within 1,000 mi. of it, government sources say.

Australian Guessing Game

MELBOURNE

A policy statement by the government's Defense Minister, Sir Philip McBride, that the air force plans to replace its Australian-built Sabre fighters and Canberra bombers with more modern types, coupled with the visit here of a British aircraft industry mission, has stirred speculation that Australia may be ready to buy British.

The Sabre, although adopted three years ago, is only now beginning to come off the assembly line of the government aircraft factory at Fisherman's Bend.

McBride also disclosed the government's plans to get new aircraft to replace Dakotas in one of two transport squadrons and to buy jet trainers to replace the piston-powered Wirraways.

Australia soon will send an aircraft production team overseas to study methods of building supersonic fighters and other advanced bomber types. The question asked here is whether they will merely be shopping for new ideas or whether the British mission has made a successful sales pitch.

UNDER ONE ROOF

By James J. Haggerty, Jr.

(No. 1 in a series)

"Government Plant No. 6 in Marietta, Georgia, is a new wonder of the industrial world"

Says James J. Haggerty, Jr., Aviation Editor, Collier's Magazine

If a list were made of the seven industrial wonders of the world, there is little doubt that one would be U. S. Government Aircraft Plant No. 6 (GAP-6) in Marietta, Georgia.

GAP-6 is the world's largest integrated aircraft plant *under one roof*. Operated for the U. S. Air Force by Lockheed since 1951, it builds six-engine B-47 jet bombers and modifies hundreds of other B-47's to keep them up to date. It produces Lockheed C-130 turbo-prop combat cargo planes, yet it still has room to make other, bigger aircraft in its massive B-1 building—all *under one roof!*

You get the same feeling of incredible size when you step inside GAP-6 in Georgia as you do when you first see Grand Coulee Dam, or the Empire State Building, or the Pentagon. It's the "under one roof" that makes this bigness important. There is no loss of time, no costly delay in assembly, manufacturing or tooling, for all facilities are as close as the nearest telephone. One example of its size: 70 miles of fluorescent tubing are required above its 76 acres (yes, *acres)* of floor space.

When used to capacity, GAP-6 can have four production lines—each for a different big plane.

U.S. Air Force
Govt. Aircraft Plant No. 6

Lockheed
Aircraft Corporation
(a Lockheed advertisement)

Georgia
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TOMORROW'S AIRCRAFT: *One step closer*

NOW...an a-c motor that runs "cool," retains output at extreme altitudes

Drive power you can depend on . . . that's the keynote of the new line of Westinghouse 400-cycle, a-c motors. They deliver from 1/30 hp to 3 hp continuously from sea level to 50,000 feet—and raise performance standards to new highs in reliability and efficiency.

More horsepower than ever before has been packed into extremely small dimensions—like the four-inch diameter frame which delivers 3 hp and weighs under 10½ lbs. In spite of this small size and high rpm, temperature rise is kept exceptionally low by using new cooling techniques giving optimum thermal characteristics to produce the greatest possible horsepower per pound at *all altitudes*.

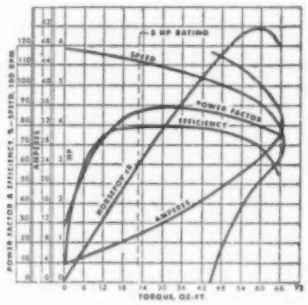
These new motors, designed to meet the requirements of specification MIL-M-7969, are totally enclosed, fan cooled and explosion-proof —ready-made for the most hazardous airborne applications. Sparks or flame caused by any abnormality cannot progress outside the motor. A patented method of flame suppression provides this same advantage on larger, open motors, over 3 hp.

Get More Information . . . NOW!

These new a-c motors—in ratings from 1/30 to 3 hp—are available NOW for direct drive and gear head applications. A drive you can depend on for vital controls and auxiliaries, they meet builder and user specifications with reserve to spare.

And Westinghouse will render full assistance in applying this new motor—the most advanced 400-cycle, a-c drive available today—to help you bring tomorrow's aircraft . . . One Step Closer. Get complete data and application information from your Westinghouse salesman or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-91016

The exclusive Westinghouse cooling design is built around an aluminum frame with integral fins. A new, efficient shrouded fan provides high volume cooling air flow. The rotor has extended conductor bars giving far more effective internal air circulation and cooling without added fan weight.

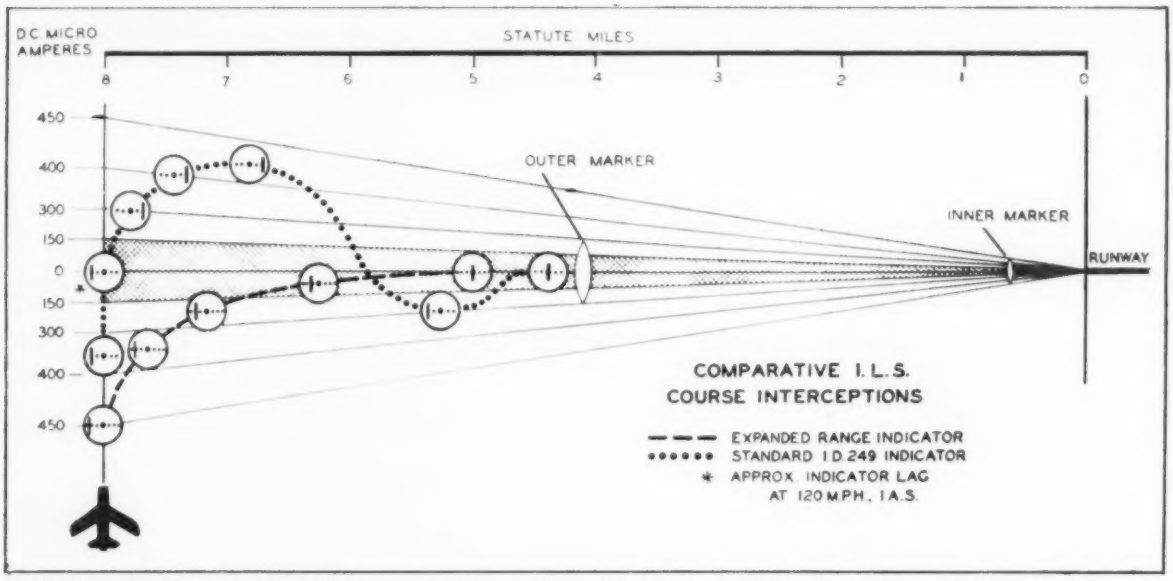


Performance curves for the 3-hp motor highlight the efficiency of these new a-c motors and their ability to handle loads from sea level to 50,000 feet. Greatly simplified and ruggedly designed, they handle even higher intermittent loads for temporary demands, especially at altitude.

Jet Propulsion • Airborne Electronics • Aircraft Electrical Systems and Motors • Wind Tunnels to Plastics

YOU CAN BE **SURE**...IF IT'S

Westinghouse



BRACKETING DURING ILS APPROACH is eliminated when old-style Omni-Mag is replaced with new Expanded Range Unit.

New Omni-Mag Smoothes ILS Approach

By George L. Christian

Teterboro, N. J.—A fundamental improvement in the operation of an important Bendix navigation aid has been made by the Eclipse-Pioneer Division working in conjunction with Marion Electrical Instrument Co.

The improved unit, called the Expanded Range Heading Indicator (or Expanded Range Omni-Mag), allows a pilot to make an asymptotic approach to the localizer beam while making an ILS landing. This holds true even if he intercepts the beam at a 90-degree angle provided he is at a reasonable distance from the airport (reasonable distance is considered to be about eight miles out, or beyond the outer marker).

Stated another way, the new instrument gives a pilot about 30 seconds of advance information that a turn must be initiated to "close" on the localizer course.

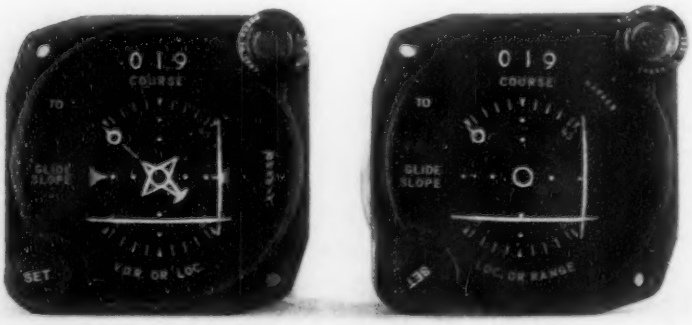
With the original equipment—the Bendix Omni-Mag (also called the ID-249, -387 or MN-97), it it impossible to "close" on course asymptotically without "bracketing" unless the approach angle to the localizer beam does not exceed 45 degrees and distance to touchdown is at least 20 miles. And the 249-style unit gives only five seconds advance warning that a turn should be initiated.

► **Safer and Easier**—By eliminating the bracketing or overshooting previously associated with making ILS approaches with the Omni-Mag, the new instrument promotes safety. It allows the pilot to make more positive, quicker approaches while using up less air space as he nears the airport. And because less maneuvering is required, the pilot has less work to do during the critical last minutes of an instrument approach.

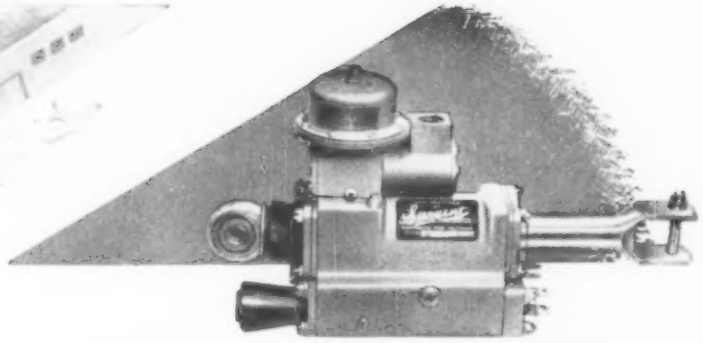
Another advantage is that presentation of both new and old instruments is almost identical. This means that pilots familiar with the old unit will immediately understand the new one.

Changeover from the old 249 type to the new Expanded Range instrument is simple. A new meter movement is substituted for the old within the Omni-Mag body. Both movements being electrically and mechanically interchangeable makes the exchange easy and inexpensive. EP officials estimate that the changeover will cost $200; if done at overhaul of the Omni-Mag, the cost drops to approximately $100. The meter movement is manufactured for EP by Marion Electrical of Manchester, N. H.

► **Twenty-Five Seconds**—In its new instrument, Eclipse-Pioneer expanded the travel of the localizer indicating bar a total of 5 degrees. It now travels about 14.8 deg. to either side of center; travel of standard cross pointer localizer indicators is approximately 12.3 deg. Also, standard cross pointer indicators use signal currents of ±150 microamperes although useful heading error



EXPANDED RANGE indicator (left) resembles old-style Omni-Mag unit externally.



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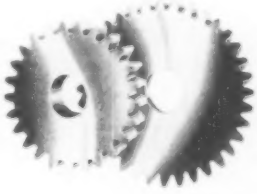

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"Good will" is the disposition of the pleased customer to return to the place where he has been well treated.
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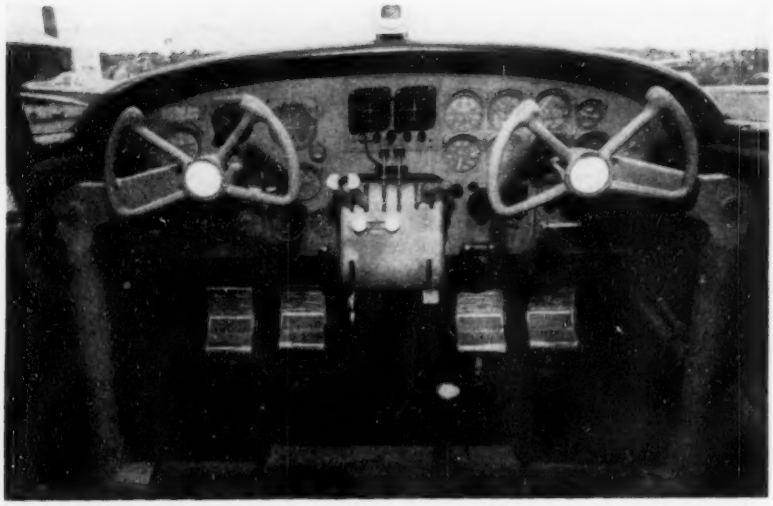


OLD AND NEW indicators sit side by side in center of Marion Co.'s Aero Commander.

magnitude and sense information up to ± 450 microamperes is available from the ground ILS localizer transmitter.

So a mechanism was developed whose sensitivity would stretch to the full 450 microamperes available and thus give approximately 25 seconds more vance anticipation of heading change since the 450-microampere signals are intercepted about that much sooner than the 150-microampere signals.

▶**Flight Test**—A flight test in Marion Electrical's Aero Commander gave practical proof of the extent to which flight operations may be improved with the Expanded Range instrument.

Four approaches were made using Newark Airport's ILS, two by the company's chief pilot, Keith Rand, and two by the writer. Each man tried one approach using the 249-type unit and each made one using the Expanded Range instrument. Both indicators were mounted side-by-side in the top center of the instrument panel. All four approaches were started at 90 deg. to the ILS localizer beam and at approximately eight miles from Newark's instrument runway.

When the turn onto the localizer was made using the 249 instrument, bracketing was unavoidable in both cases in lining the Commander up with the runway. Similarly, during the two approaches using the Expanded Range indicator, the plane was flown into the localizer beam on an asymptotic path, with no bracketing whatsoever.

Lloyd Wilson, Eclipse-Pioneer sales engineer, told AVIATION WEEK that the Expanded Range indicator is currently being evaluated by the Air Force, Navy's BuAer and by the airlines. He expects the Civil Aeronautics Administration will soon be testing the instrument too.

▶**Better Mechanism**—Eclipse-Pioneer says the Expanded Range Omni-Mag incorporates two unusual characteristics:

• "Its magnetic structure is so contrived as to provide a curve of angular deflection versus signal input which remains substantially linear in the portion of the signal current normally used for cross pointer presentation. It also provides an additional area of sharply attenuated sensitivity which makes available in a small additional scale area, useful navigational information from 150 through 500 microamperes of signal current," Eclipse-Pioneer says.

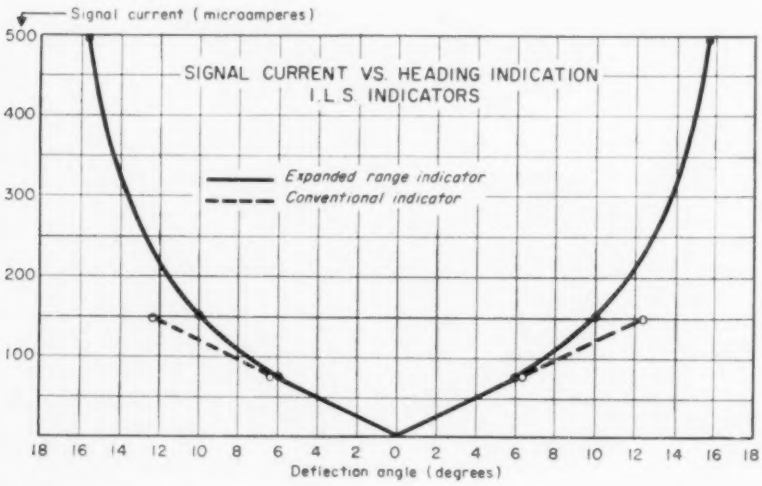
"The mechanism retains in the normal signal current area, the desired and specified ballistic characteristics. This combination of characteristics is made possible by the use of an Alnico V core magnet with sharply oriented grain structure produced by a chilling cycle in its heat treatment. This magnet permits sharp attenuation of the leakage field at the extremes of mechanism travel."

• "A corollary feature of the mechanism . . . is its substantial freedom from the influence of random acceleration or vibration. This is accomplished by a combination of factors. Among them are: use of a single air gap with a flux density of 6,000 gauss average; doubling the torque arm; and an approximate one-third weight reduction of the pivoted system.

"The increased torque developed for a given signal current is three times that of previous indicator mechanisms. The reliability index of mechanisms of this type can often be expressed as a function of the unit bearing loading which, in this mechanism, is approximately 9% of that of conventional mechanisms. This comes from the combination of keeping the moving system's weight down as low as possible and using larger bearing radii permitted by the much higher torque," Eclipse-Pioneer concludes.

▶**Precision Heading**—To give its new, Expanded Range Omni-Mag the most exact compass heading information possible, Eclipse-Pioneer tied its heading indicator (a small pointer pivoted at the center of the instrument) into its new Executive Compass System (heart of the system is the same precision, electrically driven gyro used in EP's well-known Polar Path navigation system).

The Executive Compass's master indicator is equipped with an autosyn transmitter which will drive up to four repeater compasses located remotely anywhere in the aircraft. An EP spokesman said: "By hooking up the Executive Compass to the Expanded Range Omni-Mag we hope to make the instruments more useful to more people . . . this is especially true because of the ease of installation and lightness of the Executive Compass . . . which is made up of three components, the directional gyro, amplifier and indicator. . . . Weights of the respective units are:



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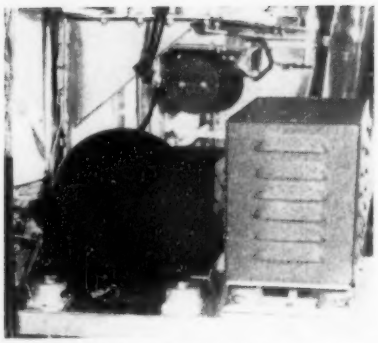


DIRECTIONAL GYRO (left) is same one used in EP Polar Path navigation system.

6.6, 1.5 and 1.5 lb. for a total of 9.6 lb."

▶**With VOR Too**—The Expanded Range Omni-Mag may also be used for cross-country navigation. It simplifies this job for very much the same reasons it simplifies ILS operations.

For example, the new instrument permits a pilot to intercept a new outbound radial with a minimum of bracketing. New courses may be selected with greater precision and less maneuvering. "Centering" the course needle to determine a heading is also accomplished more readily "since considerably greater indication of direction and magnitude of error is given."

OFF THE LINE

DC-3 operators may have their aircraft modified for operation at 26,900 lb. gross takeoff weight using Wright R1820-56, -66 or -72 engines (with 16-9 propeller reduction ratio) equipped with Ham Standard aluminum-blade 23E50/6477A-0 props and modified nose ring cowl at Aerodex, Inc., Miami International Airport, Miami, Fla. Aerodex says it has obtained Civil Aeronautics Administration approval to perform these modifications which involve operating the Wright powerplants at 1,350 hp. for takeoff. Aerodex will also furnish flight manuals for the 26,900 lb. operation.

Four-to-one: A Pratt & Whitney Aircraft engineer recently made this comparison between the relative powers of the 28 cylinder R4360 Wasp Major reciprocating engine and the J57 turbojet powerplant: The eight J57s which power Boeing's B-52 bomber generate as much power as 35 R4360s.

What flying weather in Iceland is like may be gathered from the fact that a Navy squadron based there has operated half of its total flight time this year under IFR (Instrument Flight Rules) conditions.

You a target?

Let's face it . . . we're all targets!

If your plant is not ready with a disaster plan, better act now. There's not a single American plant that's out of range of an intercontinental bomber—and fires, floods, tornadoes or explosions can kill you just as dead as an atom bomb.

It costs next to nothing to take a few simple steps which may save hundreds of lives. Here they are. Check them off today.

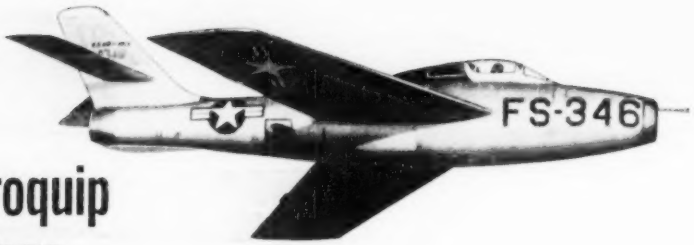
☐ **Call your local** Civil Defense Director. He'll help you set up a plan for your offices and plant—a plan that's safer, because it's integrated with community Civil Defense action.

☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here, again, your CD Director can help. He'll advise you on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First-Aid Training Courses. They may save your life.

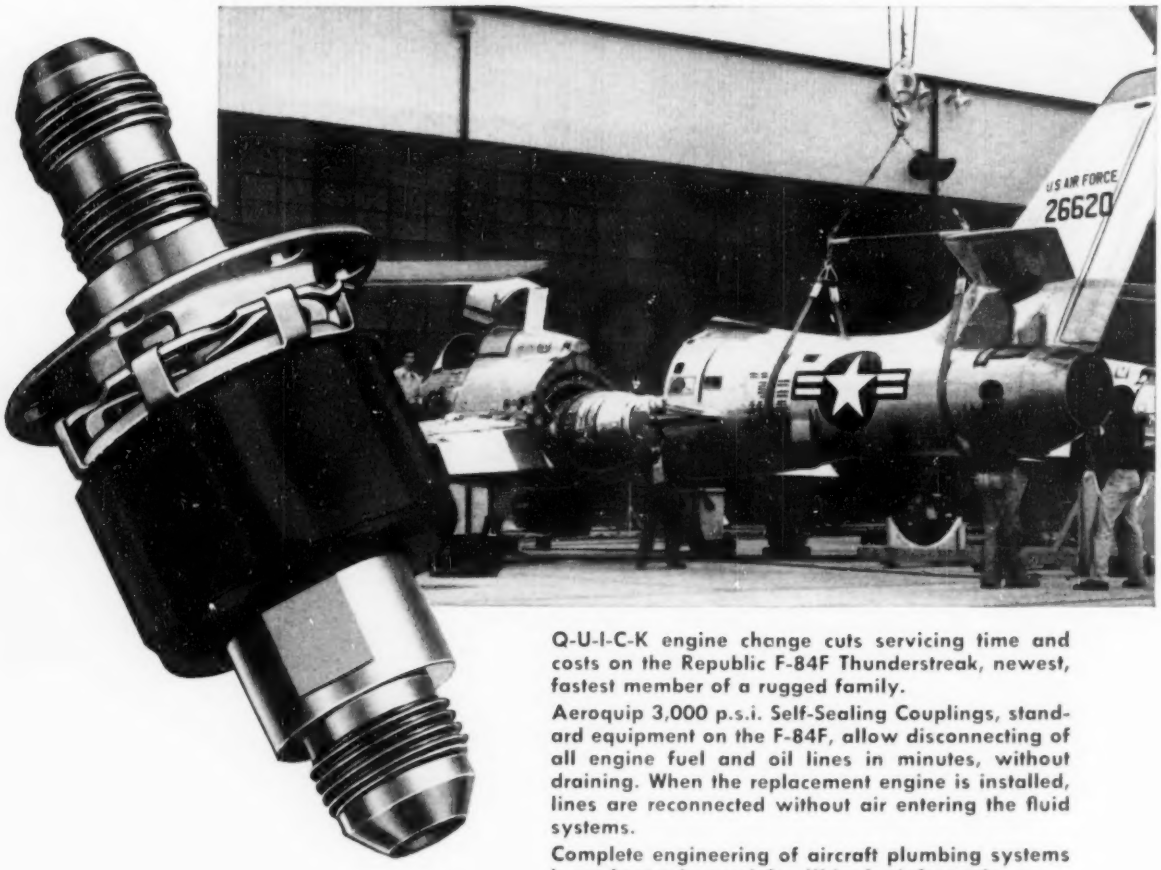
☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good community relations—and no greater way of helping America.

Act now . . . check off these four simple points . . . lives are at stake . . . have you a right to delay?



On the New Republic F-84F, Aeroquip Self-Sealing Couplings

SPEED ENGINE CHANGE



Q-U-I-C-K engine change cuts servicing time and costs on the Republic F-84F Thunderstreak, newest, fastest member of a rugged family.

Aeroquip 3,000 p.s.i. Self-Sealing Couplings, standard equipment on the F-84F, allow disconnecting of all engine fuel and oil lines in minutes, without draining. When the replacement engine is installed, lines are reconnected without air entering the fluid systems.

Complete engineering of aircraft plumbing systems is an Aeroquip specialty. Write for information.

Aeroquip

REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN
AERO-COUPLING CORPORATION, BURBANK, CALIFORNIA
(A Subsidiary of Aeroquip Corporation)

Manufacturers of Aeroquip Flexible Hose Lines with detachable, reusable Fittings; Self-Sealing Couplings; Brazed Aluminum Elbows
LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

NEW AVIATION PRODUCTS

RED PLUS BLUE equals black.

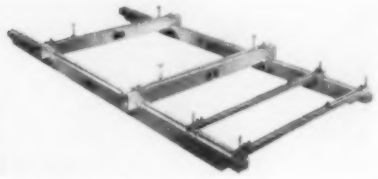
Rose-Colored Glasses Make Blind-Flying Hood Opaque

It takes less than a minute, says the manufacturer, to install or take down a new blind flight practice hood which uses a pair of filters to block outside visibility.

The hood is built of blue transparent Plexiglas. It encloses only the pilot being checked. The trainee wears red spectacles, which combine with the blue shield to black out the exterior, although allowing a clear view of the instruments.

The hood folds flat, 16x30x1 in., and weighs only 12 oz. The kit, with all hardware, installation instructions, and carrying case, costs $67.50 for the Cessna 140, 170, 180 and Beech Bonanza. Aero Commander and Beech Twin-Bonanza installations sell for $97.50.

Line-O-Site Co., Baxter Springs, Kan.



AMC is testing new Harvey skid.

Aluminum Alloy Skid Can Carry 10-Ton Load

A strong, lightweight aluminum alloy skid developed for handling and shipping heavy machines and equipment is offered by Harvey Aluminum, Torrance, Calif.

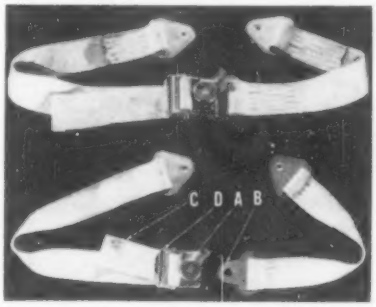
Skid is made from standard shape 6066-T6 (66S-T6) Harvey material, can be used with handling equipment such as lift jacks, lift trucks, cranes, rollers, dollies, casters, etc. A number of the units have been bought by USAF Air Materiel Command for developing research data.

Put together or disassembled quickly, the standard S-1 model will take a six-ton load concentrated in the middle of the runner beams; with the load spread out from the center, capacity increases to 10 tons.

Harvey Aluminum, 19200 South Western Ave., Torrance, Calif.

New Seat Safety Belt Has Quick-Release Knob

The Harley Model 24200 passenger safety belt features a simple, quick-turning knob allowing fast opening. The 5-lb. belt exceeds the 3,000-lb. minimum load specified in Civil Aeronautics Authority TSO-C22B. Now being produced in the U. S., the belt was developed in Great Britain for the Royal Air Force.



BELT PARTS: A, release knob; B, engaging tongue; C, pull tab; D, webbing release bar.

A safety feature prevents using the belt improperly, the maker notes. An engaging tongue is inserted into a slot until it actuates a safety pin, dropping a locking plunger into place. Turning the knob while the belt is under tension causes it to part, with an ejection action.

Among the British civil aircraft using this belt are the turboprop Vickers Viscount and Bristol Britannia. During Queen Elizabeth's trip around the world, a number of the belts were sent to Trans-Australia Airlines and fitted to the Convair 240s used by the Queen and her party.

Atsco, 1926 East Siebenthaler Ave., Dayton 4, Ohio.

Light Alternator Drive Features Ball Pistons

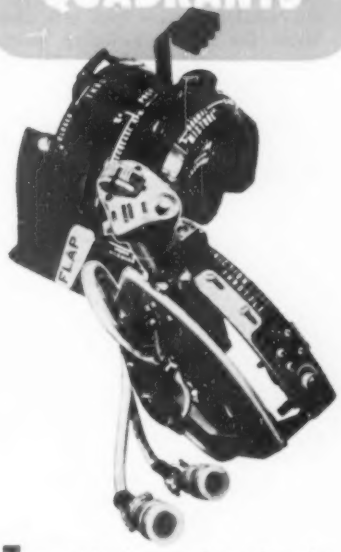
Use of raidal piston hydraulic transmissions containing precision steel balls instead of conventional cylindrical pistons, connecting rods and bearings makes possible simpler, lightweight constant-speed alternator drive for use on aircraft.

Most of the important functions of the unit are contained in one compact

Still using old-fashioned controls?

get

ADAMS-RITE CONTROL QUADRANTS



These and other quadrants have been developed by Adams-Rite to meet customers exact specifications.

We can design and build engine controls to *your* requirements for both piston and jet engine airplanes.

You can rely on Adams-Rite Experience

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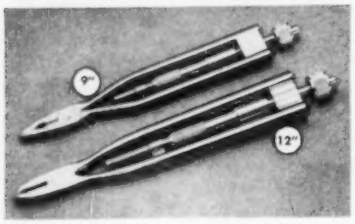
Midwest Representative—George E. Harris & Co., 1734 N. Hillside, Wichita, Kansas. Offices: St. Louis, Kansas City, Dallas.

Canadian Representative—Railway and Power Engineering Co., Montreal. Offices throughout Canada.

ROBINSON WIRE TWISTER
now in 2 sizes!



New 9" Slendernose for bench work on magnetos, carburetors, instruments and sub-assemblies. 12 oz. weight.

12" Standard for assembly line safety wiring. 15 ounce.

Split second whirling action safety wires 3 engines in time formerly required for one. Saves as much as $140 per engine assembled.

3-tools-in-1 — Pliers . . . cutters . . . twisters.

Side cutting, oil tempered heads.

Permanent bronze bearing, no adjustments.

Jaws lock on wire, can't slip off.

Unconditional money back guarantee.

Write for details including prices, testimonials and list of users. **RALPH C. ROBINSON CO., Box 494, North Sacramento 15, Calif.**

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100% RELIABILITY with CIRCLE SEAL VALVES

Floating "O" Ring construction gives perfect seal in:

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- RELIEF VALVES
- MANUAL RELEASE VALVES

Write for catalog information

CIRCLE SEAL *precision valves*

JAMES•POND•CLARK

2181 East Foothill Blvd., Pasadena 8, Calif.

unit. The new drive, when combined with a 400-cycle a.c. generator, gives all the benefits of a.c. electrical power available without use of inverters. The drive, is in effect, a continuously variable ratio gear box which automatically adjusts variable engine speed into the constant speed required to drive constant frequency a.c. generators.

Permissible continuous-duty rating of the new drive goes up directly with input speed, GE states. A drive delivering 15 hp. (9 kva.) at 4,000-rpm. input speed will deliver 30 hp. (20 kva.) at 8,000-rpm. input speed. Drive efficiency averages about 80%. Weight of the unit is approximately one-pound-per-horsepower in 85-hp. drives and about two-pounds-per-horsepower in small units.

The device will operate either on a separate oil supply or off the engine oil system. A small oil cooler is necessary when a separate system is used. Production of the new GE drives will range from 15 hp. (9 kva.) to 85 hp. (60 kva.).

General Electric Co., Aeronautic & Ordnance Systems Division, Schenectady 5, N. Y.

New Micrometer Reads Direct in Ten-Thousandths

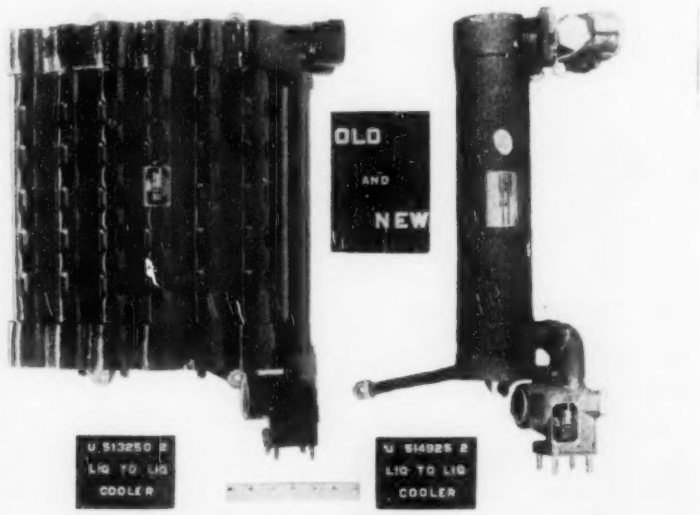
There is no need to decipher a vernier to get accurate readings to ten-thousandths of an inch with a new micrometer caliper available from L. S. Starrett Co. Faster measuring is another feature, there being no necessity to rely on feel to get the correct spindle pressure.

OUTER THIMBLE gives .0001 reading.

Here is how it works: An inner thimble reads in thousandths and an outer thimble has large, widely spaced graduations in ten-thousandths. The measuring faces are brought up snug to the part being checked and then loaded by continuing to rotate the outer thimble through about nine or ten divisions.

The outer thimble is allowed to return under spring tension until the .001 graduation on the inner thimble lines up with the reading line on the sleeve. The .0001 reading is taken directly from the outer sleeve. The maker claims an accuracy within .00005-in. throughout the "mike's" range. Range of the instrument is from zero to one inch.

L. S. Starrett Co., Athol, Mass.



Smaller and Lighter

Rapid advance in design of liquid-to-liquid heat exchangers manufactured by United Aircraft Products is graphically illustrated by this photo. In three years, UAP has been able to shrink the size of the heat exchanger from that shown on the left to the slim new unit on the right (actual dimensions are not given). New unit's wet weight of 17 lb. is 3½ lb. less than old exchanger's dry weight of 20½ lb. Dry weight of new exchanger is 13 lb. Capacities of both are identical: With oil flow of 80 lb./min., fuel flow 39 lb./min., oil outlet temperature of 250F, fuel inlet temperature of 130F, the coolers will dissipate 3,600 Btu./min.

Inconel "X"

may hold the key to your aircraft design problem

JET AFTERBURNERS boost power, but pose ticklish design problems. Bellows connection between main engine and afterburner must withstand high heat, flex through desired range, prevent hot gases from escaping. This bellows meets all specifications, enables afterburner to supply extra getaway zoom with top efficiency. Designed and manufactured by Solar Aircraft Company, San Diego, Calif., the bellows is made from .010 Inconel "X" sheet which is welded into a circular band — and then corrugated.

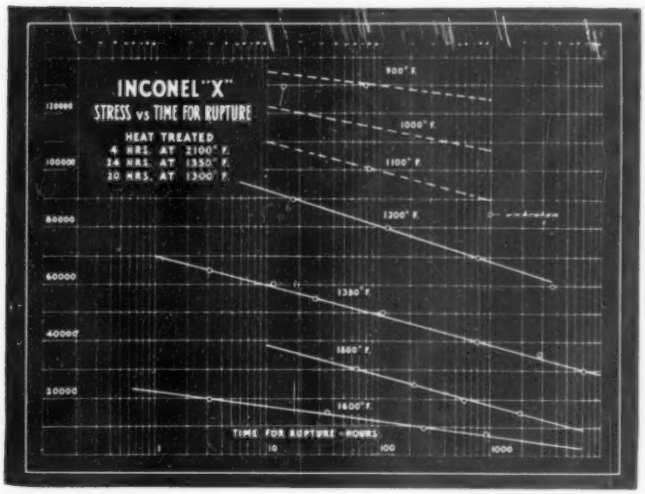
Suppose you wanted an alloy that met these specifications:

—High elastic limits above 1300° F.
—Outstanding high-temperature strength
—High resistance to oxidation
—Readily fabricated into shape needed
—Weldable by commonly-used methods

Then, Inconel "X"® is your alloy! An age hardenable alloy, it has every one of the properties mentioned — and a good many to spare. The jet plane afterburner bellows shown above is one application where Inconel "X" filled the bill. There are countless other aircraft jobs where it also meets all needs.

Let's take a brief look at some of the principal characteristics of Inconel "X".

After suitable heat treatment, it is an unusually strong alloy both at ordinary temperatures and at red heat. It offers excellent resistance to oxidation at high temperatures.



And under high stresses at 1200° to 1500°F, it has an outstandingly low creep rate. This property, combined with a relatively low coefficient of expansion, makes it particularly useful for moving parts which must operate in small clearances.

It is also useful where a high modulus of elasticity is needed. Its stiffness is about equal to that of alloy steels.

Spring properties are excellent. When drawn into spring wire, it resists fatigue, stays flexible and strong at temperatures up to 1000°F.

Resistance to impact is good too. And you also have hardness . . . machinability . . . good forging and fabricating qualities. As for welding, this can be accomplished by most of the commonly-used methods including metal arc, inert gas metal arc or hydrogen arc, resistance spot and seam, and resistance butt.

In short, Inconel "X" is the kind of metal you can work with — and get the results you want.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N.Y.

INCO TRADE MARK **Nickel Alloys**

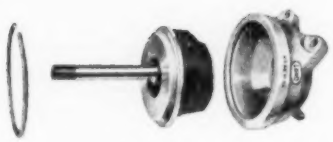
MONEL® • "R"® MONEL • "K"® MONEL • "KR"® MONEL
"S"® MONEL • INCONEL® • INCONEL "X"®
INCONEL "W"® • INCOLOY® • NIMONIC® Alloys
NICKEL • LOW CARBON NICKEL • DURANICKEL®

Add Greater Strength to Lighter Weight...

and take your PROFIT IN PAYLOAD!

The New LORD MR-36M DYNAFOCAL ENGINE MOUNTING

FOR R-2800 C ENGINES



EXPLODED VIEW

Ask about maintenance cost savings you can enjoy by using Lord Core Renewal Service on Dynafocal Suspensions.

THIS new Lord Dynafocal Mounting is interchangeable as to vibration characteristics and physical dimensions with any mounting now in use on Convair 240 and 340, Douglas DC 6 Series, Martin 404 and Military Aircraft using R-2800c engines. The Lord MR36M is stronger than any mounting of previous design. Its light weight saves up to 16 pounds per engine, depending on the type of mounting system now used. This new Lord Dynafocal can replace your present heavy mountings without any rework whatever.

The Lord MR36M Mounting is approved by CAA, USAF and Navy Bureau of Aeronautics. The reduced weight on 2 and 4 engine aircraft enables you to realize an immediate profit in additional payload. For complete details you are invited to write direct or refer to the field offices listed below.

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DETROIT 2, MICHIGAN	**NEW YORK 16, NEW YORK**	**CHICAGO 11, ILLINOIS**	**CLEVELAND 15, OHIO**
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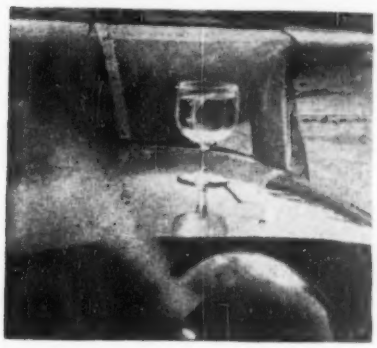
LORD MANUFACTURING COMPANY • ERIE, PA.

LORD BONDED RUBBER

Headquarters for **VIBRATION CONTROL**

LETTERS



No Magic Glass

In reference to the picture of the glass of water on the cowl of the Cessna 180 on p. 53 of the Aug. 23 issue of AVIATION WEEK magazine, we were wondering if either you or any of your readers could tell us why the glass of water does not blow away.

GIFFORD ASHER, RICHARD STOREY, BERTHA M. RYAN, JOHN M. CALLIGEROS
Aeroelastic Lab
Cambridge, Mass.

(AVIATION WEEK asked Gardner Advertising Co., which prepared the advertisement for Cessna. Their answer follows.—ED.)

Regarding the Cessna advertisement which shows a glass of water balanced on the cowling of a Cessna 180, we offer the following information:

The photo of the glass of water on the cowl of the Cessna 180 that appeared in the Aug. 23 issue of AVIATION WEEK was taken on the ground at about 1,200 to 1,500 rpm. The weight of the glass and water was about 1¾ lb.

Since the airplane was not in motion, the only wind force acting on the glass of water was that induced by the action of the propeller. Thrust decreases from the tip of the propeller to the hub, due to the decrease in the speed of the propeller, proportionate to the decrease in the circumference of the propeller arc.

There is also a change in the shape of the propeller from an airfoil at the tip and center of the blade to a cylindrical shape at the hub, resulting in an additional loss in the thrust of air around the engine and cowl area. This is the reason for some of the cooling problems resulting when an airplane idles on the ground for any length of time. At 1,500 rpm. with the airplane not in motion there is not enough slipstream created in the cowl area to move a 1¾-lb. glass of water.

W. J. ROGERS
Gardner Advertising Co.
915 Olive St.
St. Louis 1, Mo.

Trouble Records

It strikes me—if the idea is not already in effect—that a device is needed in new type planes which might bring valuable data to our attention in case of a destructive accident in the air.

I am thinking particularly of the mysterious Comet mid-air explosions, but it could likewise apply to other planes.

I would suggest a fire- and explosion-proof voice recorder type of machine which would continually record and erase over a 2-minute period certain critical data, including perhaps (1) interphone or cockpit conversation, (2) attitude of plane, (3) time, (4) telemetered critical engine or other data of suspected source of trouble.

The machine should wire-record and erase automatically during entire flight; should be cut off upon unusual attitude, heavy shock or high temperature; and should be protected by buoyancy and shielding from the elements, for future use upon recovery.

C. A. BOND
Captain, U. S. Navy
U. S. Naval Reserve
Officers' Training Corps
University of Michigan
Ann Arbor, Mich.

Vibration

In reference to letter you published from M. R. Seldon, Chance Vought Aircraft, the author discusses a problem which has been equally disturbing to the Shock and Vibration Group at Bell Aircraft Corp. It is interesting to note that more people are becoming interested in this field of technology.

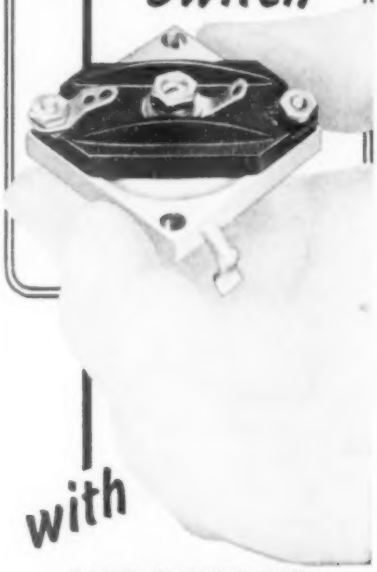
The existence of an academic definition for vibration or shock would seem to be of minor importance at the present time. The textbook definition of vibration has been adequate for years and a lengthy discussion of the precise definition of shock would use up much time required for real problems. The number of versions would probably equal the number of authors on the subject.

The real field which requires work lies in the future. We are on the threshold of a new era in equipment design; indeed, many of us have been forced across that threshold in recent years. The advent of the guided missile and the rocket-powered aircraft has forced changes in the concepts of isolator design. The customary low-frequency mounting system, as it is used today, must be revised to meet the following conditions:

(a) Steady-state flight accelerations in all three planes of 5G or more.
(b) Steady-state flight attitudes at all angles up to and including complete inversion.
(c) Highly oxidizing atmosphere caused by the rocket propellants.
(d) High temperatures up to 300F.

New, or rather revised, design parameters must be utilized to meet these conditions. These new systems will serve to end the old arguments over shock vs. vibration protection. The mount stiffness required in all planes, to meet the steady-state loads will restrict the isolator natural frequencies to a band normally assigned to so-called shock mounts. We will then obtain a nominal amount of shock protection combined with high-frequency vibration isolation. The

Miniature
Altitude Switch



with

IMPORTANT DUTIES

Weighing only 2.335 ounces these minute devices tell the Jet Pilot when to apply oxygen, pressurize the cockpit and level off at service ceiling. It also functions as an automatic radio gain control, protects aerial photography film, and monitors the emergency fuel control system. To undertake these and other important duties faithfully, this snap action aneroid must be manufactured to the most exacting specifications. When calibrated to 40,000 feet pressure altitude, it responds within ± 1500 feet upon being subjected to extreme physical and environmental conditions. Manufactured by the Diaphlex Division.

We invite your inquiry.

Cook Electric Company

Established 1897
2700 Southport, Chicago 14, Illinois

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ONE $925.00* CHAMBER FOR ALL YOUR TEMPERATURE TESTING PROBLEMS

Here's a temperature test chamber to fit every test program. Combining features not offered in any unit of comparable price, it reflects the long-term experience of one of the nation's leading environmental test facilities—Wyle Laboratories—where it was developed.

Simplicity . . . and the highest quality materials and workmanship . . . combine for rugged, permanent dependability. Full-opening, counterbalanced lid, access holes for actuation lines or instrument leads, and an insulated observation window provide outstanding operating convenience.

In the laboratory with only a light work load, the D-102's wide range makes it a complete temperature test facility. In the busier laboratory, the unusually low price permits purchase of several units to break a testing bottleneck.

Complete information on request.

- −100° to +300°F, ±2°F accuracy.
- Fully automatic . . . dual thermostats for high and low temperatures.
- 12 cu. ft. working volume, stainless steel lined.
- Block dry ice refrigerant.
- High-efficiency 6" glass wool insulation.

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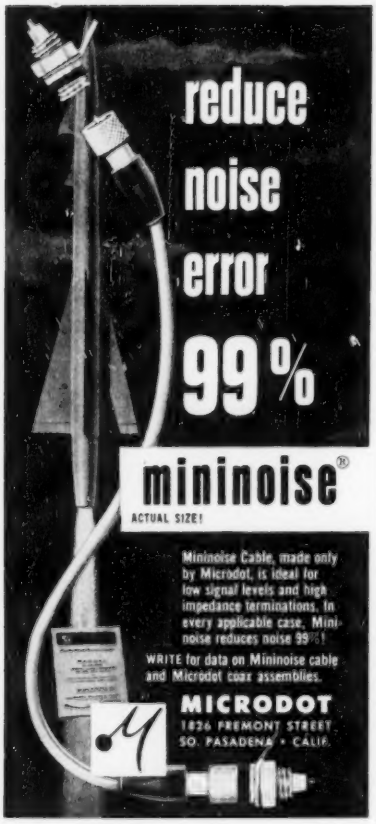
132 Maryland Street • El Segundo, California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99%
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ACTUAL SIZE!
Mininoise Cable, made only by Microdot, is ideal for low signal levels and high impedance terminations. In every applicable case, Mininoise reduces noise 99%!
WRITE for data on Mininoise cable and Microdot coax assemblies.
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equipment installed on such mounts must be similar in design to ground force communications gear.

Greater emphasis must be placed upon cooling and this factor will control cabinet size and arrangement. The newer stacked tubes, shockproof relays and ruggedized components will have to be employed to insure operation under the stiffer vibration requirement. The damping available must be such as to permit peak transmissibilities at resonance of no greater than 3.

A logical question to follow all of the above is, "What can we gain by all of this?" The primary advantages are as follows:

(a) We can provide equal isolation at all conditions of flight in aircraft no longer keyed to the G tolerances of the human pilot.

(b) We can successfully ship our missiles to the launching site and account for the shipping problem in equipment design. Current airborne equipment breaks down all too often during ground shipment. All too often we ignore the fact that the flight time of a missile is a small percentage of its life.

(c) These mounts may be applied to a greater variety of airframes. Helicopters, for example, cannot easily use the low-frequency aircraft suspensions now available.

(d) There is a possibility of standardization between aircraft and vehicular mounts which will save the thousands now spent on duplication between various mount manufacturers' "standard" sizes. Is there a real need for so many mount types?

In conclusion, the problem may be summed up as follows:

(a) The possibility of vibration isolation, as we now interpret it, is becoming antiquated in the face of current aircraft performance.

(b) The thermal, shipping and corrosion problems are largely ignored in our current designs.

(c) Our current equipment is too fragile to suit the requirements of the airframes which we now use.

(d) Greater emphasis should be placed on the development of rugged tubes, relays and other components for use in aviation equipment.

RAYMOND G. YAEGER
Senior Vibration Test Engineer
Gen. Engineering Laboratories
Bell Aircraft Corp.
Buffalo, N. Y.

Praise

I would like to take this opportunity to thank you and your organization for the very fine stories of our A4D Skyhawk that have appeared in four of the recent issues of AVIATION WEEK. They are very much appreciated by all of our employes who worked on this airplane so diligently in order to produce it in record time and unprecedented weight.

So far, the airplane is doing very well and we think it will give an excellent account of itself in service, as well as result in a great saving to the taxpayer.

E. H. HEINEMANN, Chief Engineer
Douglas Aircraft Co., Inc.
El Segundo, Calif.

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first essential in aircraft electronics

Engine-control electronic equipment is frequently installed in close proximity to the turbojet engine. Therefore, electronic components must be designed and constructed to function with *complete reliability* under extreme ambient conditions. However, the degree of reliability attained depends largely upon the attention given to detail in applying these five major design principles to every phase of equipment development:

1. Conception of basically simple circuitry to accomplish desired control functions.
2. Rugged design of mechanical details.
3. Selection of components based upon extensive environmental and life tests.
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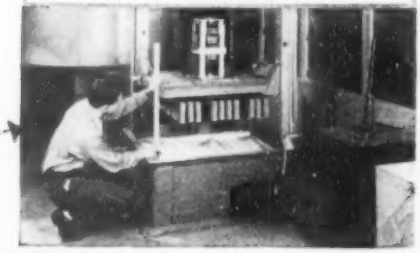
5. Adequate performance tests of production units under dynamic operating conditions.

Strict adherence to these principles has enabled us to achieve extreme reliability in all our aircraft electronic equipment. We believe our years of concentrated research, development and tests devoted exclusively to automatic control systems for jet engines can be of real value in solving your control problems. Our engineering counsel and extensive manufacturing and test facilities are at your service. We welcome your inquiry.

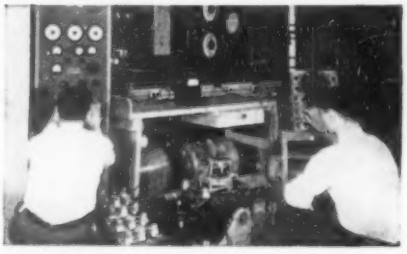
TEMPERATURE CONTROL AMPLIFIER *(Illustrated above)*. Modulates exhaust nozzle area of a turbojet engine to maintain a constant turbine exit temperature. Input signal is derived from thermocouples. Output controls a servo which supplies hydraulic power to the exhaust nozzle positioning actuators.

TEST SPECIFICATIONS. **MIL-E-5009A:** Altitude, ignition proof, sand and dust, humidity, sustained acceleration, impact. **MIL-E-5272A:** Salt Spray. **MIL-E-5007A:** General specification. **MIL-I-6181:** Radio interference.

SIMULATED OPERATING CONDITIONS PROVE COMPONENT PERFORMANCE

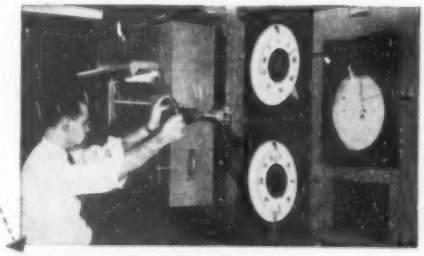


IMPACT. Unit must withstand impact shocks of 30g for a time duration of not less than 10 milliseconds.



VIBRATION. Operational accuracy guaranteed at 5g from 20 to 55cps and at 10g from 55 to 225cps.

SUSTAINED ACCELERATION. Unit must operate satisfactorily while subjected to sustained acceleration of 8g along its longitudinal axis, 10g along its vertical axis, and 5g along its horizontal axis.



FLIGHT TEST CHAMBER. Unit performance checked under simulated flight conditions within a temperature range of minus 65° F. to plus 200° F., a relative humidity of 95%, and at all altitudes up to 50,000 feet.

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This task force at Solar's Des Moines plant is studying a new diffuser assembly for a turboprop engine, on which Solar is working both in stainless steel and in titanium. Clockwise are Charlie Ragan, assistant contracts manager; Bill Dixon, chief production engineer; Bob Ballard, manager of manufacturing; Ed Gunton, assistant plant manager—operations; Bill Schilling, chief design engineer, and Hi Brown, chief metallurgist.

A Solar Task Force can help you solve special problems

IN EVERY NEW SOLAR PROJECT, the first step is the formation of a project task force. The requirements of the new job are studied and the engineering and shop skills demanded by it are noted. Next, individual engineers and specialists in these fields are selected from Solar's many departments, from research through production.

These men, as a team, are charged with full responsibility for the successful completion of their project. Each task force team is free to call for additional specialists whenever they are needed.

Through this task force system, each project – large or small – benefits from *all* of Solar's knowledge and 27 years' experience in designing and building heat resistant alloy products. The task force system has resulted in many important design improvements, as well as impressive savings in production costs.

Solar will be happy to assign a task force team to help *you* solve special problems.

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Your inquiry regarding any Solar service or facility will receive prompt attention. Address Solar Aircraft Company, Department A-36, San Diego 12, California.

WHAT'S NEW

New Publications

Life-saving news for lightplane pilots is contained in **180-Degree Turn Experiment, Aeronautics Bulletin Number 11,** a 64-page report by University of Illinois' Institute of Aviation describing a procedure for pilots untrained in instrument flying to follow in bad weather. Address: Urbana, Ill. . . . **Fundamentals of Friction and Lubrication in Engineering** is bound collection of 12 papers presented at first national symposium of the American Society of Lubrication Engineers. Publication includes complete bibliographies with over 300 references. Price: $3.50 ($3.00 to ASLE members) from American Society of Lubrication Engineers, 84 E. Randolph St., Chicago 1, Ill.

Digest of New York State Laws Affecting Aviation is available free of charge from the state's Department of Commerce, 112 State St., Albany 7, N. Y., or any of the department regional offices. . . . National Machine Tool Builders' Assn. has issued 40-page **Glossary of Engineering Terms for Hydraulic Presses.** With later reports yet to come, association hopes to pave way for interchangeability of dies and fixtures between hydraulic and mechanical presses. Glossary is available from the association, 2071 E. 102nd St., Cleveland 6, Ohio; price, 75 cents. . . . **Pallets and Palletization** is 20-page handbook designed to become "bible to all pallet users." It is available without charge from many pallet suppliers, or for $1.00 from National Wooden Pallet Manufacturers Assn., 215 Barr Bldg., Washington 6, D. C.

Guide for A&E Mechanics, 12th Edition, contains basic information needed by mechanics; 128 pages; $2.00; published by Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26, Calif. . . . New 48-page publications list gives all **American Standards** that are presently available. Write to American Standards Assn., 70 E. 45th St., New York 17, N. Y.

Telling the Market

Full specifications on South Bend Lathe's complete line of **machine tool attachments and accessories** is contained in 40-page Catalog 5418, available from South Bend Lathe Works, 425 East Madison St., South Bend 22, Ind. . . . Sciaky Bros. offers two new bulletins: No. 313-12 covers new Sciaky **standard multiple electrode machine (SX 36 G)** for high-production resistance welding applications; No. 319-12 describes Dial Feed, **a universal, rotary indexing unit** for use with resistance welders, machine tools and various assembly operations; address: 4915 W. 67th St., Chicago, Ill. . . . Pioneer Model VH-215 **Hand Broaching Machine** is described in two-color, four-page bulletin, available from Pioneer Branch Co. The company's address: 6434 E. Telegraph Rd., Los Angeles 22, Calif.

Ball-bearing swivel joints, loading racks, manifolding lines, flexible aircraft assemblies are among products described in 32-page Catalog G-4, available from Chiksan Co., Brea, Calif. . . . Engineering Manual 201G is 64-page catalog describing **aircraft, electronic and industrial clamps** manufactured by Thomas Associates, 4607 Alger St., Los Angeles 39. . . . Resistoflex Corp. has issued a 16-page catalog describing its **aircraft hose and hose assemblies** for use in hydraulic, fuel and oil systems. Address: Belleville, N. J. . . . **Tubular steel scaffolds and materials hoisting towers** made by Beaver Art Metal Corp. are shown in 16-page general catalog and parts list No. 56 that describes the company's Advance line. Write Dept. 7-5, Ellwood City, Pa.

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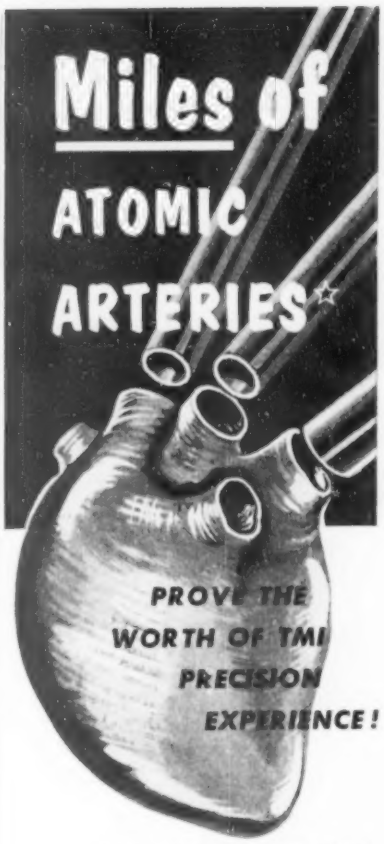
Orders are coming in at a rate that promises a complete sellout. The price is $3.00 per copy. Send your check or moneyorder to: AIRPORT DIRECTORY, McGraw-Hill Publishing Company, 330 West 42nd Street, New York 36, N.Y.



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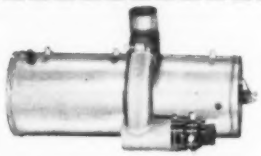

S-50 . . . 50,000 Btu/hr rating. Weight, 20½ lbs. Dimensions, 21½" x 7". Already standard equipment on many transports, it serves Beechcraft Models B-50, and D-18, and many other private planes.

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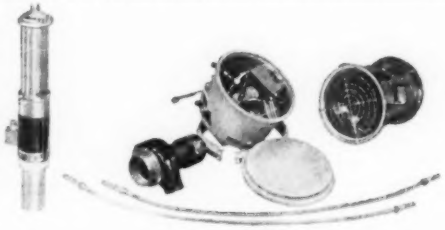

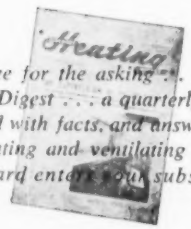

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Hughes Comes Back Strong After Blowup

• HAC heads for sales of $200 million this year despite loss of key men and growth of competition.

By Philip Klass

Los Angeles—A year after resignation of Hughes Aircraft's top management-scientist team—which some feared might lead to a mass exodus that would shake the company's foundations—HAC appears today to be scarred but not too badly hurt by the experience.

A Defense Department spokesman, in a good position to know, told AVIATION WEEK that there are very few companies today which can match Hughes' staff, its experience, facilities, or enthusiasm in the military systems business.

▶ **The Scars**—However Hughes has lost a number of top-notch scientists and engineers who held key positions or were engaged in advanced development, a loss which may not show up for a couple of years. For example, of the 50 original members of HAC's advisory council (made up of senior scientists) listed in May 1953, approximately 40% have left during the past year.

(However, staff attrition at lower working levels has generally been very much lighter.)

In addition HAC has lacked permanent top management to set long-range policy and objectives. A successor to W. C. Jordan, who took over as general manager last fall and resigned this June, has not yet been named. In the interim, the company is being operated by an executive committee consisting of four Hughes vice presidents, each of whom is also responsible for operating a major division within the company.

Howard Hughes is known to have been considering Maj. Gen. Clarence Irvine as a successor to Jordan, but there is said to be some opposition to his appointment within HAC (AVIATION WEEK Sept. 20, p. 19). It is believed that Hughes recognizes that he must choose wisely to avoid serious morale problems that would follow if a third general manager were to quit.

▶ **Business Is Good**—Although Hughes has released no figures, observers report that the company this year will gross slightly more than last year's $200 million, despite the general stretchout throughout the industry. Production of fire control systems for the current crop of interceptors (F-86D, F-94C, F-89D) is down somewhat. However, production of newer and more complex fire control for the F-102, plus expansion of Tucson's production of the Falcon air-to-air missile have reportedly taken up the slack.

Hughes, until recently primarily an Air Force supplier, has gotten a multi-million-dollar Signal Corps contract to develop an integrated mobile anti-aircraft system. The system will include surveillance and tracking radars, computers, and data collators.

HAC has also cracked the Navy's interceptor fire control business. At least partially this is the result of troubles with the new Westinghouse system, which that company is trying to clean up.

▶ **But Competition Is Tougher**—Despite all this, Hughes is facing tougher competition. If USAF's current competition for a new interceptor fire control system had been held 18 months ago, the odds would have been running very high in HAC's favor, because of its pre-eminent skills, facilities, and experience. Today, at least a few HAC officials are worried that it may go to a competitor, possibly North American Aviation's Downey group, RCA, General Electric, or to others anxious to enter the field. The reason: USAF's desire to get a few of its eggs out of the Hughes basket.

When the Hughes blowup came last fall, practically all USAF's interceptor fire control and air-to-air missile development, and most of its production capability, were centered in this one company. There was so much concern over the future of these vitally important projects that top AF circles were reportedly considering the possibility of severing the government-owned, Hughes-operated Tucson missile facility.

Air Force reportedly decided against such a move, because HAC's missile R & D group was located at the main Culver City plant, and because of possible repercussions in business circles.

▶ **New Prime Suppliers**—During the past year, Air Force has taken steps to broaden its base of fire control suppliers by bringing in RCA and North American Aviation, and possibly others. RCA had earlier been set up as a sec-

HAC'S CULVER CITY PLANT is center of company's research and development activities.

Second Look at Hughes

A year ago, Hughes Aircraft Co. was rocked by resignations of its top management which in five years had built it into a $200-million-a-year avionics firm and a top producer for air defense. The formation and rapid growth of two new companies, Ramo-Wooldridge Corp. and Litton Industries, headed (and partially staffed) by former key HAC people, was described in this space Oct. 11 and Oct. 18.

There has been considerable speculation on Hughes' present status. Aviation Week's Avionics Editor, Philip Klass, has prepared the following report on Hughes Aircraft today, based on conversations with persons in and outside of Hughes who have followed the company's operations during the past year.

highest

and fastest

Bell Aircraft's X-1A rocket-powered research plane has flown higher and faster than any other piloted aircraft in the world.

While these two world records are outstanding achievements in aviation history, their importance as altitude and speed marks is overshadowed by their more significant contribution to aeronautical research. Both these records were attained as a normal part of the continuing research program so necessary to the continued growth of the U. S. Air Force.

From these flights, data pertinent to human as well as aerodynamic reactions at high speeds and high altitudes are constantly being accumulated. Much of these data are already at work in the nation's supersonic aircraft, guided missile and rocket propulsion efforts.

The creative thinking, sound engineering and advanced developmental and production planning that are an inherent part of all Bell productions, made the performance of the X-1—the world's first supersonic aircraft—and its successor, the X-1A, more than record-shattering flights. They are milestones of research . . . the kind of research that Bell Aircraft Corporation is contributing to the needs of national defense and this country's military and economic future.

And there are excellent opportunities for qualified engineers and scientists to help carry on the programs which are making Bell famous for aviation firsts. Resumes are invited.

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ond source on HAC fire control.

Some Hughes people express concern over the possibility that Ramo-Wooldridge Corp., headed by two former Hughes vice presidents, and staffed by former HAC people with fire control know-how (AVIATION WEEK Oct. 11, p. 48) may collaborate with one of its competitors in the current interceptor fire control competition. This apprehension is spurred by the fact that R-W, shortly after it was formed, took on a consulting contract with Westinghouse's Air Arm division to assist in solving its current fire control system problems.

► **Advanced Electronics Hit**—Hughes Aircraft's advanced electronics lab has been the hardest hit by loss of scientific personnel, with the radar (fire control) division running a close second, according to a former HAC official who still retains close contacts with the company. The advanced electronics lab's work in digital computers and electro-data machines is reportedly suffering, delaying the company's entry into commercial fields.

On the other hand, the guided missile division and electron tube lab have lost few scientists, except for normal turnover, he reports.

An examination of the list of HAC's senior scientists on the advisory council 18 months ago, shows that of the nearly 40% (20) who have left, approximately half have joined Ramo-Wooldridge, another 25% have gone with Litton Industries, new company formed by Charles B. Thornton, former HAC assistant general manager. (AVIATION WEEK Oct. 18, p. 62).

(During last fall's "crisis," it was reported that Howard Hughes offered attractive bonuses to key people to get them to remain. This was confirmed to AVIATION WEEK in one instance by a scientist and long-time HAC employe, who said he turned down a very sizeable bonus to take a top spot elsewhere.

► **Some Who Left**—An idea of some of the important posts vacated can be gained from a list of some of the advisory council members who joined R-W. For instance, Dr. Ralph P. Johnson was former assistant technical director of HAC's R & D labs; Dr. F. M. Grabbe was former associate head of computer systems; Dr. B. F. Miller and W. B. Hebenstreit were former head and associate head of the advanced electronics lab; Dr. Harper Q. North was former head of the semi-conductor department.

At Litton, H. W. Jamieson was former associate head of the radar labs; Dr. Sidney Frankel was associate head of microwave research, and Sig Hansen was co-head of the storage tube section in the electron tube lab.

► **Why Some Left**—To understand the

. . . control counts

When a jet knifes its way through the sky in supersonic flight, *temperature's the critical factor*. The hidden automatic controls that meter fuels, harness temperatures, and control pressures, must do their jobs instantly and dependably in the face of torrid engine temperatures and ambients.

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collective motivation behind the limited exodus of top scientists, it is necessary to understand the strong allegiance which many felt toward Dr. Dean Wooldridge and Dr. Simon Ramo, and to a lesser extent toward Thornton, who had a following among HAC's management people.

To at least a number of the senior scientists and engineers, Ramo and Wooldridge were Hughes Aircraft Co. They were the prime movers in building HAC's scientific staff to a position of pre-eminence, having personally enticed many of the key people from other companies. Ramo and Wooldridge created at HAC the kind of research environment seldom found outside a pure research lab. Their "scientist is king" philosophy was carried to the point of providing plush carpeted offices for key scientists, an almost unheard of luxury.

When, after earlier warnings that all was not well, Ramo and Wooldridge announced their plans to leave, followed by resignations of Thornton and Gen. Harold George, HAC's general manager, it looked to many of the senior scientists as if the roof was about to cave in.

▶ **Why Most Stayed**—There were obviously many in the 1,200-1,500 scientific staff, particularly among the more recent additions, who felt no such strong ties with Ramo and Wooldridge, and who therefore stayed on.

The opportunity for personal advancement opened up by top-level departures seems also to have been a factor. When HAC's major expansion tapered off a couple year's ago, paths of advancement were clogged by top, second, and third tier supervisors who were only in their twenties and thirties, with a long time to go before retirement.

Still another factor was the appeal by top AF officials, and by the departing management, for men to stay on the job lest serious damage result to vital defense projects. At least several key men, who had already made up their minds to leave, agreed to stay on for a suitable cooling off period.

▶ **More Settled Today**—Hughes people report that conditions today are "much more settled than ever before." They say that HAC "more closely resembles a solid commercial operation and is less a 'wonder company'."

This is not to say that everything is running smoothly at Hughes. Even before the blowup, HAC faced problems which always accompany a large organization and which become more difficult when the company has mushroomed rapidly.

But if HAC can fill in the voids in its management and scientific staff, despite the short supply of top scientists, before it seriously effects long-range development, and if there is no repeat performance of last fall's experience, the company should continue to play a dominant role in the avionics field.

Like a fast-rising prizefighter who finds himself on the canvas for the first time, but gets up a more experienced fighter, the overall effect of the recent crisis at Hughes Aircraft Co. may turn out to have been salutary.

New Avionic Bulletins

New technical bulletins on devices of interest to persons in the avionics field include:

• **Motor application chart** shows at a glance which of a variety of servo motors are available with one or more of the following: signal switch, limit switch, filter, clutch, brake, gear train, governor. Servo motors come in three basic types: permanent magnet and wound field d.c., and 400-cycle a.c. Burton Manuf. Co., 11201 W. Pico Blvd., Los Angeles 64, Calif.

• **Diodes and transistors,** including power types, are listed and application engineering data given in three bulletins, TE1300, TE1312, and TE1313. Transitron Electronic Corp., Melrose 76, Mass.

• **Solenoids,** available in 300 different types, are described in Bulletin SO-100-300. Joseph Pollak Corp., 81 Freeport St., Boston 22, Mass.

• **New transducers,** four types, for measuring vertical, horizontal and torsional vibrations are described in data sheets available from Consolidated Engineering, 300 N. Sierra Madre Villa, Pasadena 15, Calif.

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Here's a closeup of the top radome, composed of Hexcel Glass Fabric-Plastic Honeycomb in ¼" cell size, faced with glass fabric skins.

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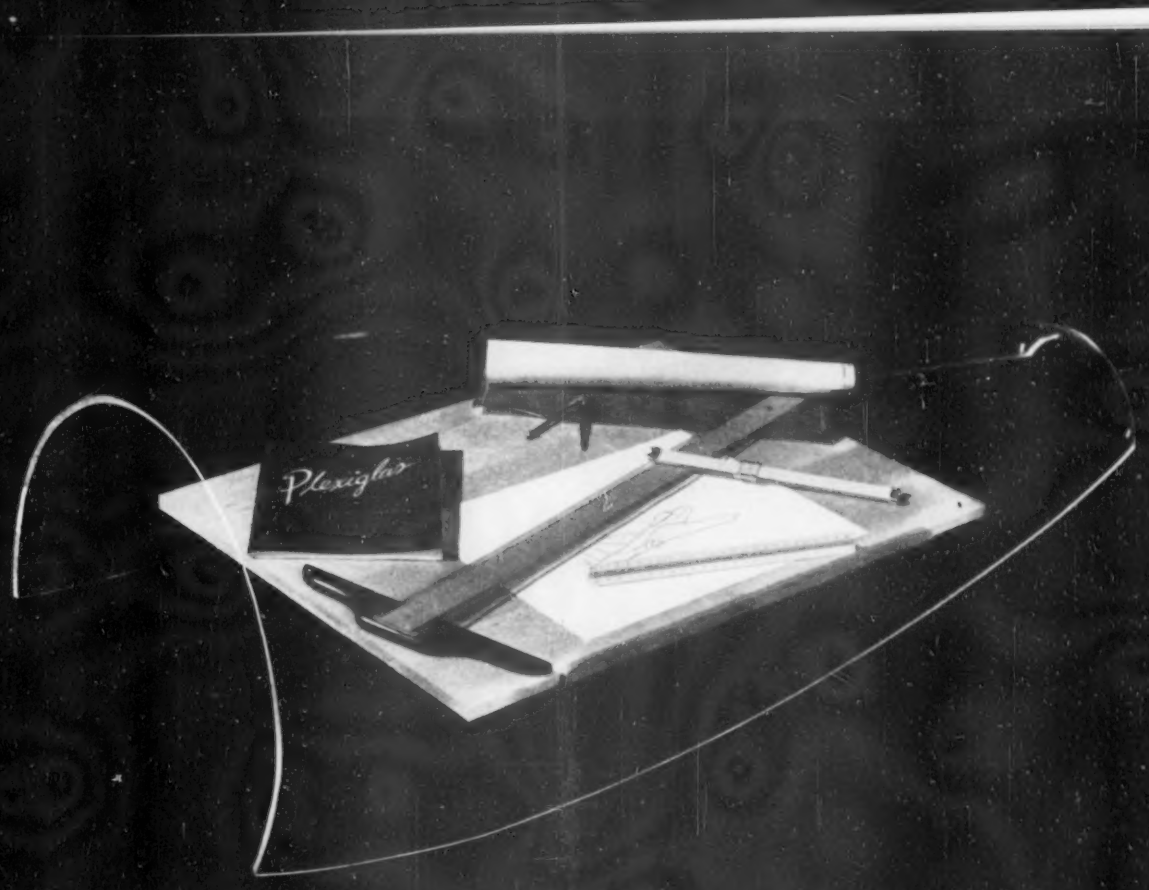

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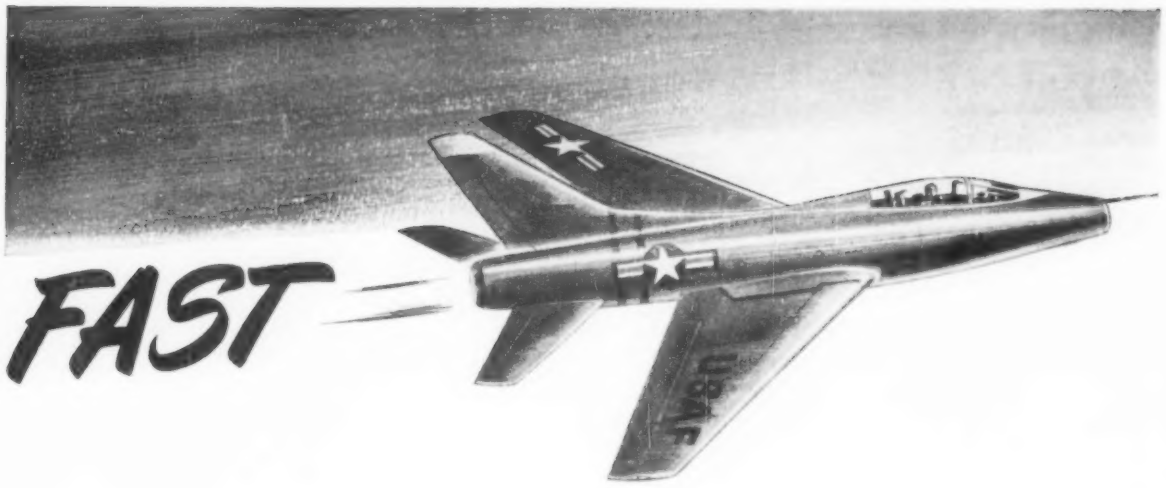

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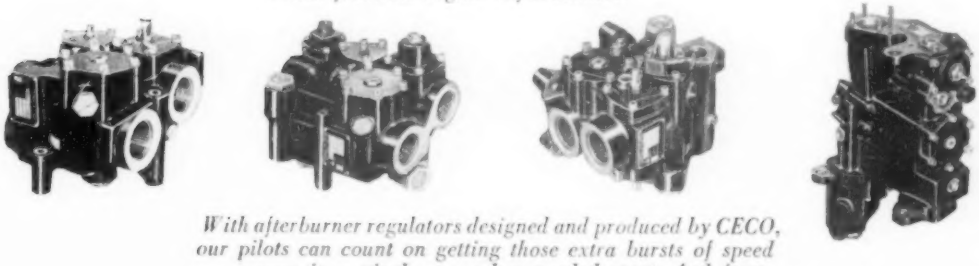

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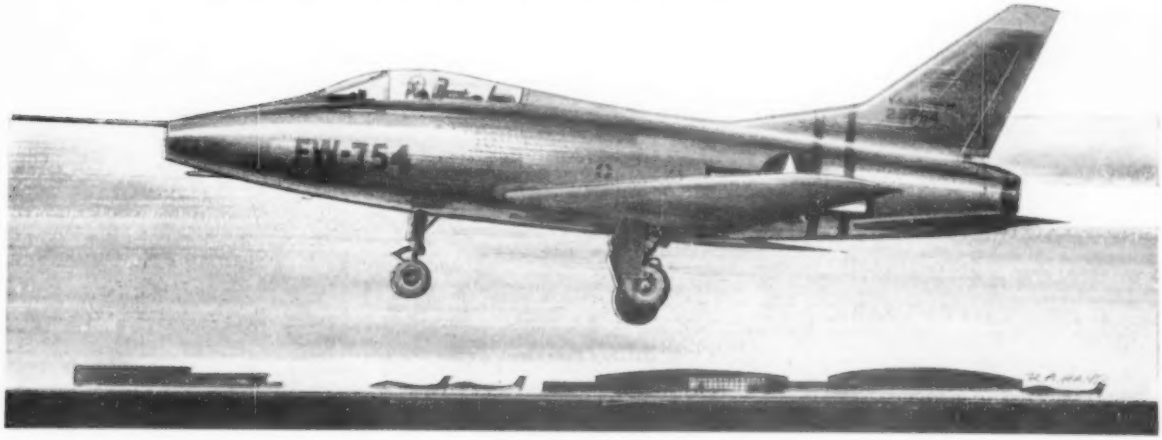

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Report on RTCA Symposium

Military Supports Common System

Defense offers information pertinent to program: Air Force says it may step up switch from VHF to UHF.

Evidence of a strong military desire to cooperate in setting up the Common System of air navigation and traffic control is seen in expressions by armed forces spokesmen during the recent Radio Technical Commission for Aeronautics symposium in Washington, D. C.

Recognizing that there is only one acceptable public stand on such subjects as the Common System, motherhood, and sin, the expressions by military spokesmen nevertheless were significant.

The military sometimes are accused in certain civil aviation circles of having "sabotaged" the program several years ago because of tactical needs arising from the Korean war. The Tacan-DME controversy (AVIATION WEEK Mar. 15, p. 126), mentioned frequently during the symposium, is one aftermath of the earlier civil-military schism.

Subject for discussion by RTCA's nine-man panel of experts was: "Where are we and where are we going with the Common System?" The symposium produced a modest amount of heat on the first question but shed little light on the second.

► **Military Cooperation**—Previous inability of civil agencies and groups engaged in Common System planning to get access to information on classified military developments long has been a sore point. It was a factor in the current Tacan-DME problem.

However, Henry Randall, office of the Assistant Secretary of Defense for Research & Development, said steps are under way to declassify as much information pertinent to Common System programs as possible.

Any RTCA special committee that believes it needs information on classified projects can approach his office, Randall added, and the Defense Department will try to break it loose.

Upon hearing of present congestion in civil VHF communications, Maj. Gen. Gordon Blake, USAF's chief communications officer, said the military may accelerate its move from VHF to UHF to relieve this congestion. (Blake's presence, although not a panel member, was evidence of the military's interest in Common System planning.)

Blake also said the Air Force does not intend to abandon VOR until the end of its useful life, although he failed to indicate when this might be.

► **Conciliatory Moods**—The military representatives were not the only ones in a conciliatory mood.

J. B. Hartranft, Jr., president of the Aircraft Owners & Pilots Assn., said he believes general aviation users are ready to accept a shutdown of L/MF radio ranges, providing Civil Aeronautics Administration agrees to use the resultant savings to install low-power, low-altitude VORs to fill gaps in the present Victor airways.

Hartranft's views were based on a recent AOPA survey that shows a large number of its members are VOR-equipped and nearly half are navigating by VOR more than 50% of the time.

In reply, CAA Administrator Fred B. Lee said the military still have a requirement for L/MF ranges that prevents their early shutdown. However,

Tacan Details

First official details on the military Tacan navaid system indicate its bearing accuracy is better than civil VOR but that its distance accuracy is slightly under that of civil DME. The Navy released information on Tacan during the Radio Technical Commission for Aeronautics symposium.

The Tacan airborne equipment, AN/ARN-21, provides both VOR and DME service in a single three-quarter ATR size package weighing 85 lb. (By comparison, civil VOR and DME for airline use each occupy a half ATR and together weigh 90-115 lb., depending upon the manufacturer.) Maximum Tacan range is 200 nautical miles (comparable to VOR-DME), Navy says.

Navy figures give Tacan a bearing error spread of ± two and a half degrees and a distance error spread of ± one nautical mile, on "uncalibrated equipment." Recent tests on experimental equipment sited in a good location showed errors under 0.5 deg. 95% of the time, with 0.8 deg. maximum error, Navy says. CAA Administrator F. B. Lee questioned Tacan performance figures, saying the matter still is under investigation by the Vortac committee.

Navy claims Tacan requires less critical siting, provides better over-water performance and takes less equipment than civil VOR-DME.

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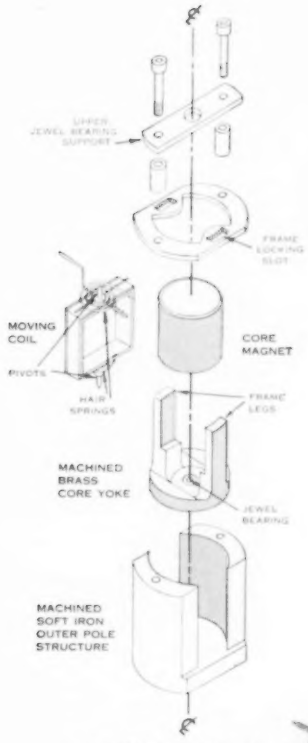

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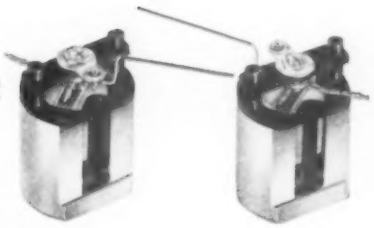
Marion coaxial mechanism

A new AN type multi-element aircraft instrument, incorporating recently developed Marion Coaxial Mechanisms, has greater durability and performance stability than many existing instruments of much greater size and weight. Applications of the new instrument, available with two, three or four elements, include ammeters, voltmeters, temperature indicators and radio navigational instruments. They meet the requirements of Army-Navy Aeronautical Design Standard AND10401 for 2¾" dial instruments.

The Coaxial Mechanism making these improvements possible represents a new Marion concept in the mechanical design of moving coil mechanisms. The Coaxial assembly provides a self-shielded magnetic field of great strength, uniformity and stability. Ruggedness and stability are inherent in the basic simplicity of the design. Only two fasteners hold the rigid, interlocked assembly together. All critical dimensions are machined from a common center (the bearing axis), facilitating precise alignment of parts.



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he reported that CAA plans to install 63 new VORs by June 1956 to serve as gap fillers, terminal area fixes and to provide bypass airways.

If current studies indicate the need for more, they may be added, Lee said.

► **How Common?**—The RTCA panel raised the old question of how common the Common System should be—and produced a variety of answers.

Hartranft complained that the private flyer and his pocketbook have not been included in Common System thinking and planning, despite the fact that nearly half of the 18,000 private fliers hold instrument ratings.

However, Defense Department's Randall cautioned that the Common System can not be reduced to the lowest common denominator without adversely affecting its usefulness in peacetime and war. "Compromise by some users is necessary," he said.

Jean H. DuBuque, executive director of the National Business Aircraft Assn., spoke out against attempts to impose military tactical requirements on the Common System, an obvious reference to the current Tacan controversy.

► **Problem Areas**—A statement by Lee that CAA expects a 60% increase in load on its air route traffic control centers by 1960 served to underscore serious shortcomings cited by some panel members under today's traffic density. Two examples:

• Lack of direct communications between most ARTC centers and the aircraft under their control poses a serious problem, according to Vernon Weihe of the Air Transport Assn.'s air navigation and traffic control group.

Weihe termed present communications "archaic." "We have made no progress in closed-loop, fail-safe communications system," Weihe said, referring to the oft-discussed "private line." "We are using, in effect, a rural party line with no bell or dialing system, and frequently we have to talk through the operator."

• "We are on the brink of entering one of the blackest eras of air traffic control," Capt. J. D. Smith, representing the Air Line Pilots Assn., warned Smith complained about gaps in the Victor airways that force airline pilots to use both L/MF and VOR as navaids, about interruptions in the flow of traffic along the airways.

Smith called on the ANDB to recognize the close inter-relationship between avionic navaids and airport lighting. He urged planners to stop looking for a utopian system and to go to work on today's problems, adding that pilots would welcome the opportunity to participate in Common System planning. (The ANDB recently added a former American Airlines engineering pilot and captain, Sam Saint, to its staff.)

As partial confirmation of Smith's dire predictions, Saint cited Sept. 15 as a black day in the New York area, when heavy traffic under IFR conditions resulted in departure delays of two to three hours, with corresponding restrictions on inbound traffic. Lee said a full investigation of the causes are under way.

► **Problem Areas**—The Air Coordinating Committee's navigation panel has set up a special working group (SWG-13) to study current problem areas where more progress is needed, J. M. Beardslee, panel chairman, said.

For example, SWG-13, approximately half through its study, is analyzing the application of longrange radar for en-route traffic control and possible revision of ARTC's flight progress strip form, presently used to show aircraft positions, Beardslee said.

Lee reported that CAA is planning to expand its direct ARTC communications, including peripheral networks in which remote VHFs are tied in by land lines. It also was reported that SWG-13 is analyzing the possibility of a Boston-to-Norfolk (Va.) VHF network to provide direct ARTC coverage along the East Coast.

Col. J. Francis Taylor, Jr., ANDB director, reported briefly on some of its

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Salute to America's first all-jet bomber force

At Barksdale Air Force Base, La., late in July, the Second Air Force became America's first all-jet striking force with retirement of the last of its piston-driven bombers.

Now completely equipped with fast Boeing B-47 Stratojets, the Second Air Force is part of Strategic Air Command, America's global air arm. Its swept-wing Boeings are 600-mile-an-hour medium bombers that have broken all existing distance and endurance records for jet aircraft, including a nonstop trans-Pacific flight with aerial refueling from California to Japan.

Strategic Air Command continually flies training missions that simulate exacting combat assignments. Ranging the skies over three continents, the polar ice cap and vast expanses of ocean, SAC aircraft follow split-second timetables. Their trial bombing runs, defense and other maneuvers are all scored in a relentless drive for ever-increasing proficiency.

Entire wings, numbering 45 Stratojets and 20 Boeing KC-97 tanker-transports, are rotated regularly through scheduled training operations to English and North African bases. On these missions, tanker-transports provide aerial refueling for the jet bombers, and carry the ground personnel and equipment needed to make each unit self-sustaining for 30 days.

SAC is on an around-the-clock combat alert. Its operations have achieved such a high level of efficiency that its training missions could be transformed instantly into massive retaliatory action against the war-making power of any aggressor, anywhere.

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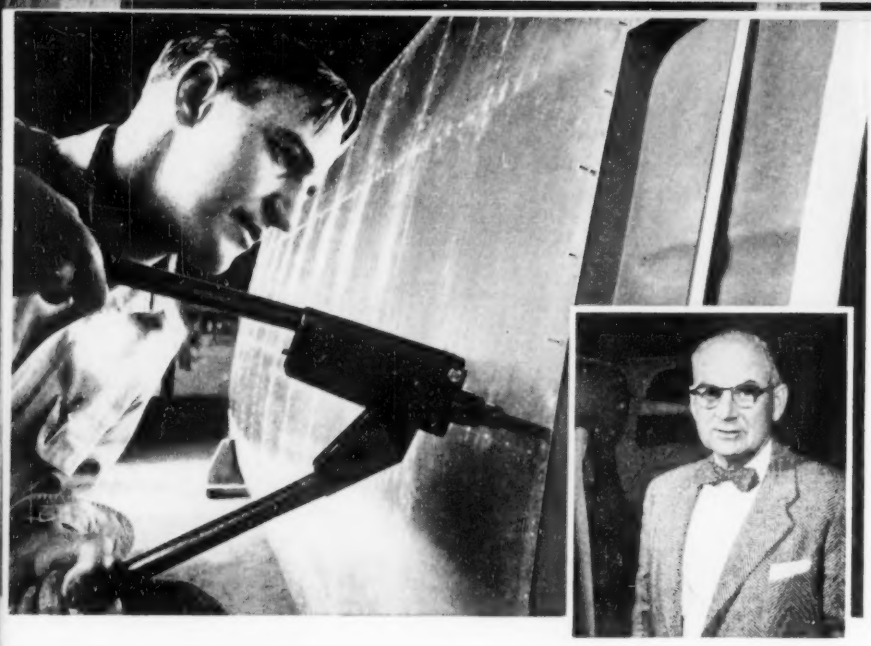

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"We Speed Repairs—Cut Maintenance Costs With Cherry Blind Rivets," Says This Fixed-base Operator

Home base airports and service shops—the very backbone of operations and maintenance for private planes—must perform continued good service and reliable repair work at reasonable cost. They know from experience that they can do dependable work—quickly and economically—when Cherry Rivets are used for a myriad of fastening jobs.

That's why Russell P. Hay, Inc., well-known Cessna dealer at Pittsburgh's Allegheny County Airport, specifies Cherry Rivets for all service, maintenance and repair work in his CAA approved shop for metal airplanes.

Mr. Hay says, "We speed repairs and cut maintenance costs with Cherry Blind Rivets. Experience has shown us that they can replace any primary or standard rivet and give long, dependable service. We use them in a variety of ways from replacing entire wing surfaces to repairing small sections of controls and mounting accessories. With Cherry Rivets one man can do the job easily and quickly—they help complete repair jobs faster, which keeps our customers happy."

This is true in hundreds of home base airports and major airline service depots throughout the world where dependable, speedy Cherry Rivets help to reduce costs—provide a fast, safe, secure method of fastening in hard-to-reach places.

The use of Cherry Rivets speeds repairs by eliminating the necessity of removing entire sections to gain access for replacement of damaged sections and parts. They are installed by one man from one side of the work by a special gun which pulls the stem into the hollow shank—upsets the end of the blind side—firmly clinches the rivet in place—fills the hole—all in a split second. There is no bucking—no hammering—no exploding. With Cherry Rivets, ships get out of the shop faster, make room for other jobs—the owner is in the air again sooner and his repair bill held to a minimum.

Cherry Rivets are but one of a group of 10,000 types of fasteners and special cold-formed parts produced by Townsend in its several plants. As "The Fastening Authority," Townsend helps you speed repairs and original assembly—and helps you improve your operation with Cherry Blind Rivets.

For detailed application information, write for Bulletin TL-76.

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programs aimed as easing current operating problems. These included:

• **Radar transponder beacon,** now undergoing operational service tests by CAA's Technical Development Evaluation Center preparatory to firming up specs for the beacon system.

The L-band (1,000 mc.) transponder, when installed in aircraft, will increase the range of ground surveillance radars to 100 miles at 20,000 feet, as well as identifying individual aircraft on radar scopes, Taylor said.

• **An electrodata system,** capable of storing up to 2,000 flight plans or weather data for instant transmission and readout to remote traffic display boards or teletype machines, will be evaluated by TDEC as an integrated system during the coming year, Taylor reported.

• **Simulation techniques** for developing new traffic control procedures, which Taylor calls one of TDEC's most important tasks, are being expanded to include evaluation of a new horizontal plotting board for possible ARTC use.

The plotting table will be covered with a map of the area under control, with a ground radar display projected in the center. The map and scope display will use the same scale. Small markers, containing flight progress strips, will be positioned manually on the table and moved onto the radar display when the plane enters the radar surveillance area.

▶ **New Steering Committee**—Recent formation of an RTCA steering committee, to review progress toward the Common System objectives and spell out problems.

The original RTCA Special Committee 31, which drew up the basic plan for the Common System, recommended the formation of such a group to monitor progress.—**PK**

FILTER CENTER

▶ **Automatic Cruise Control**—Wright Air Development Center will soon test a new automatic cruise control for the B-47, designed to position engine throttles automatically for the optimum ratio of airspeed to fuel consumption. System was developed by the J. B. Rea Co. of Santa Monica, Calif.

▶ **East Coast Avionics Conference**—Twenty-eight technical papers plus a symposium on air navigation and traffic control are scheduled for the first East Coast Conference on Airborne and Navigational Electronics to be held Nov. 4-5 in Baltimore. Technical papers will include reports on:

• Spatial stabilization with integrating gyros.

• New airport taxi radar.
• Cooling avionic equipment for high-altitude operation.
• Airborne receiver requirements for Navarho, new long-distance system.
• Advanced design VHF communications receiver.

▶**AF Seeks Light Weather Radar**—Wright Air Development Center's radiation lab has asked for proposals on a 60-lb. X-band storm-warning radar for use on small military transports. Design specs call for a 12-in. antenna, 3-in. panel-mounted radar scope, and iso-echo contour circuitry to pinpoint storm cores.

▶**New DME Approach Procedures**—CAA has approved new, more direct instrument approach procedures at Cheyenne and Salt Lake City for DME—equipped aircraft, taking advantage of their ability to orbit at a constant radius from a VOR or ILS/DME ground station. CAA has also given Narco's Model UDI-1DME the first unrestricted-type certificate for such equipment, company reports.

▶**JPL Gets New Computer**—Cal Tech's Jet Propulsion Lab recently installed a new ElectroData Corp. Model 203 digital computer for use in its rocket and missile activities. Highlights of the general purpose machine were described in AVIATION WEEK (Apr. 12, p. 60).

▶**USAF Integrates Under Tracal**—All AF research and development in the fields of traffic control, instrument approach and landing, has been integrated in a single project called Tracal (traffic, control, approach, landing) under Wright Air Development Center's Directorate of Flight and All-Weather Testing. The Tracal office, under Col. Leo N. O'Connor, will control budgets for such activities at ARDC centers.

▶**CVA Develops Data Reducer**—Chance Vought Aircraft has applied for patents on a new semi-automatic system for speeding the reduction of oscillogram data by a factor of 10 over manual analysis. In the CVA system, an operator positions a small tracing head to follow oscillogram trace, which feeds signals into an analog computer for processing, after which they are plotted by a graphic recorder.

▶**NAA Develops Small VHF**—An eight-channel crystal-controlled VHF transmitter-receiver, weighing 20 lb. and occupying less than one cubic foot, has been developed by North American Aviation's avionics group at Downey, Calif. Plug-in construction is used throughout. NAA says set is suitable for all types of aircraft. —PK

"Cherry Rivets prove to be a most satisfactory means of riveting where blind fasteners are required," says American Airlines.

Cherry Rivets speed overhaul and repair at American Airlines Depot

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Here and in other repair shops of the world's airlines, Cherry Blind Rivets provide a fast, safe, secure method of fastening. Their use speeds repair by eliminating the necessity of removing entire sections to gain access for replacement of damaged sections and parts. This gets ships out of the shop faster—puts them back on the payline quicker—helps keep operating expenses down.

Cherry Rivets are installed by one man from one side of the work by a special gun which pulls the stem into the hollow shank—upsets the end on the blind side—firmly clinches the rivet in place—fills the hole—all in a split second. Bucking is eliminated.

To learn how you can speed repairs and reduce maintenance costs with Cherry Blind Rivets in aircraft and other industries, write for Bulletin TL-76—it is yours for the asking.

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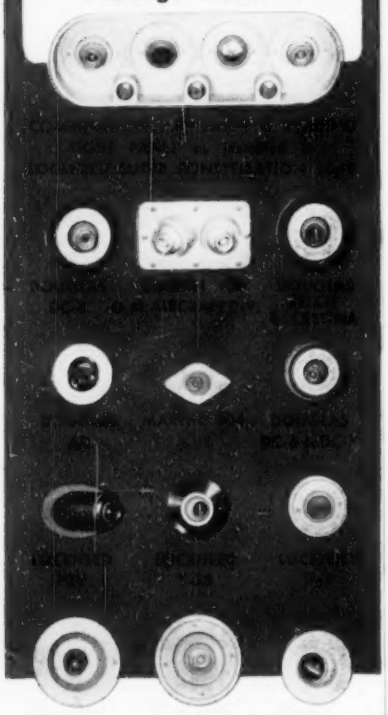

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FRANCE	60,400,000
IRELAND	4,700,000
NETHERLANDS	37,400,000
NORWAY	1,000,000
SWEDEN	100,000
TOTAL	$108,600,000

SOURCE: Foreign Operations Administration

Overseas Airlines Gain Strength

Example of growing confidence in foreign carriers: Private U.S. banks refinance KLM World Bank loan.

The recent refinancing of KLM Royal Dutch Airlines with private U.S. banks of loans formerly placed with the World Bank reveals not only the improving credit of this foreign airline, but points up the improving stature of international airline operations as a banking risk. It may well lead to other loans in this field.

► **Aid From Outside**—KLM (along with other foreign airlines) has benefited from ECA (now Foreign Operations Administration) grants. Since an equivalent of ECA grants in local currency is required to be deposited by the beneficiary in a counterpart fund, the proceeds of such grants are not directly reflected in the accounts of the company.

ECA- and FOA-paid shipments to the Netherlands from Apr. 3, 1948, to May 31, 1954, totaled $37.4 million in the form of various complete aircraft, engines, and parts.

Foreign aid grants of the ECA-type have also been important to the support of other countries. The accompanying table reveals the paid shipments in aircraft, engines and parts made during the past six years—the total is $108.6 million. This type of aid, however, appears to be at an end.

► **Air France Support**—As can be seen, France accounted for more than 60% of this type of foreign aid. It is known that Air France was the principal beneficiary of this assistance. The World Bank also indirectly financed some of Air France's equipment acquisitions. The World Bank granted France a $250-million reconstruction and development loan in 1947.

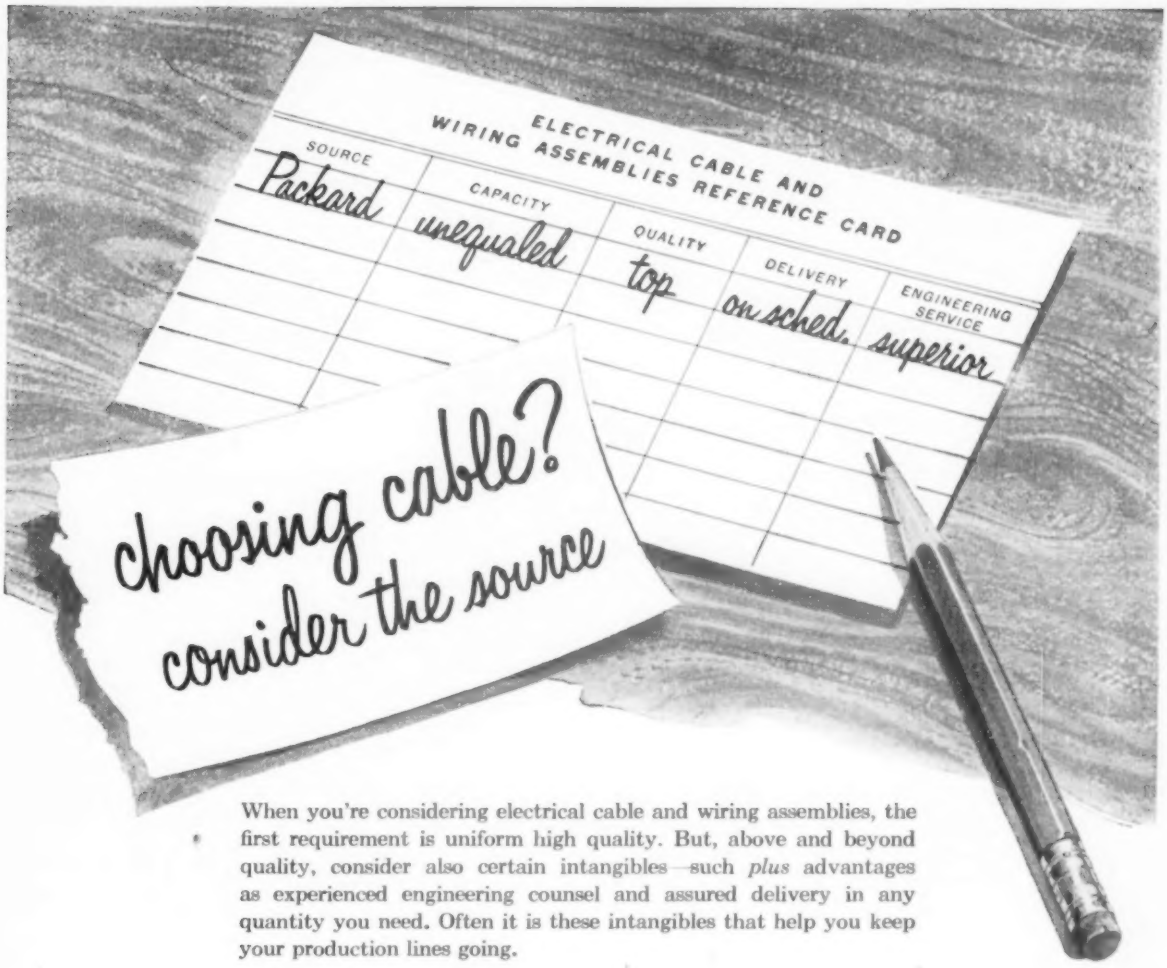
In a recent report the bank asserted that this loan helped France's air transportation: "It financed part of the cost of nine new planes for Air France's Paris-New York service."

► **John Bull's Billions**—Significantly absent from this list is Great Britain. However, the United States has extended considerable aid to the British military air program and aircraft industry (estimated at approximately $750 million from 1950 to mid-1954). In a broader measure, the United States has made substantial contributions to the over-all economy of the British through the various programs administered under ECA, Mutual Security Agency and FOA.

For example, for the period from Apr. 3, 1948 through June 30, 1954, the United Kingdom received more than $3.7 billion in aid from these programs alone. This over-all assistance to the British economy conceivably was sufficient to permit the government to support its own aircraft industry in the manner which it did, as well as subsidizing its nationalized airlines.

From 1946 through 1951 the Export-Import Bank of Washington, supported entirely by the United States Treasury, made aviation loans to various foreign governments. Many of these advances have since been repaid. However, the Export-Import Bank does not appear to be inclined to make further loans in this activity.

► **KLM's Loan**—The present KLM refinancing stems from an original $7-million loan granted the carrier by the World Bank Mar. 20, 1952. This loan represented the first advances made by that financial institution to an air carrier. Of the $7-million credit, the Chase



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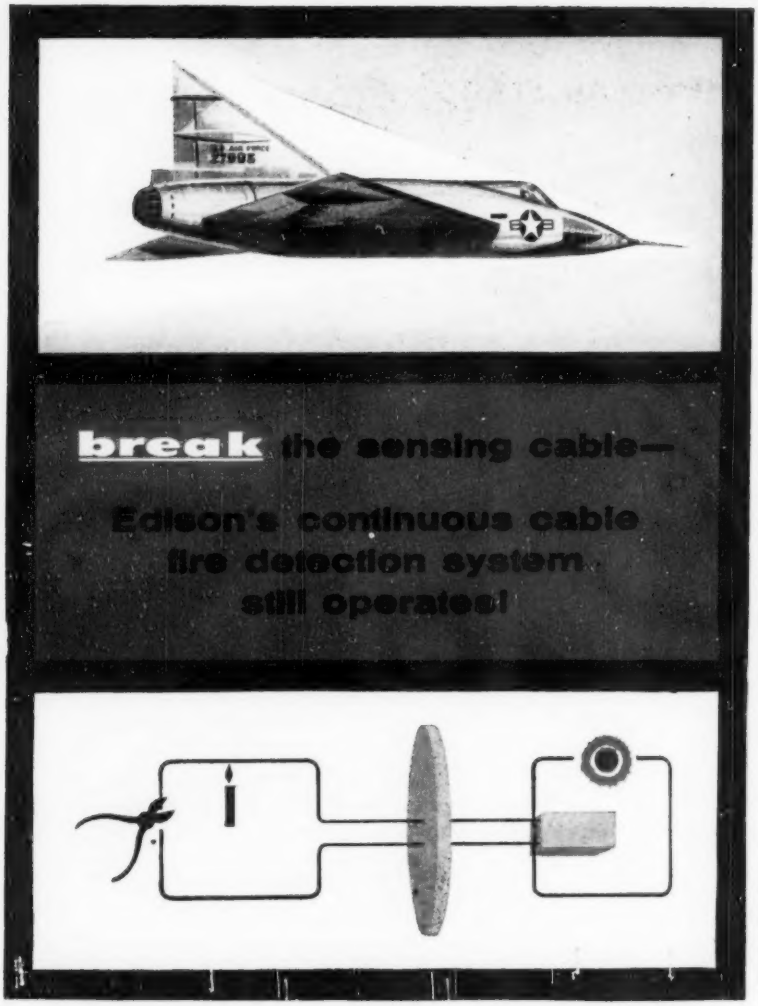

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National Bank participated directly by advancing $3.5-million. The entire loan was guaranteed by the Netherlands government and was secured by six Super Constellations. The debt was to be amortized over a six and one-half year period, bearing interest at the annual rate of 4⅛%.

This loan had been reduced to $5.6 million when it was refinanced in equal parts with the Chase National Bank and the National City Bank, both of New York. In effect, National City is supplying the bulk of the new funds in replacing the World Bank, as Chase held $2.1 million of the former notes (which were included in the refinancing). The new loan is unsecured by any aircraft and is repayable in equal semi-annual installments over a four-year period, starting on Jan. 1, 1955.

KLM had one of the best years in its history during 1953. Its recent report showed a net profit of $2,732,000 for last year compared to $1,502,000 in 1952, $2,776,000 in 1951, $15,000 in 1950, and a loss of $10.4 million in 1949. Good earnings and the release of past financial stringencies permitted the carrier to pay its first dividend in the postwar period, 4% on all shares, and amounting to $1,296,274.

▶ **Dutch Government's Role**—While largely government-owned and supported, KLM appears to be operated along independent private enterprise lines, unlike most other nationally owned airlines.

The Netherlands government owns most of the share capital, which aggregated some $32.3 million at the 1953 year-end. Much of this stock interest represents conversion of previously authorized indebtedness to the government by the company and new advances that were made by the government in 1950.

KLM has received government aid in the form of direct subsidies, capital investment, loans, guarantees of borrowing, and expenditures for airports and other facilities. KLM received direct subsidies from the beginning of its activity until World War II.

Under the basic agreement between the company and the government, approved by a law of Aug. 4, 1947, the Minister of Transport and Waterways may propose that a subsidy be granted to the company, the amount to be determined from year to year. The last direct subsidy appears to have been paid in 1949 with none since.

The refunding of the KLM loan from the World Bank to private capital is a current healthy development. It permits the evaluation of foreign airline financing on a sound economic premise without the assistance of U. S. government grants or supported lending institutions.

—Selig Altschul

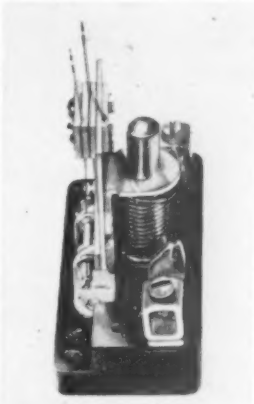
DOW CORNING CORPORATION

Silicone News

FOR DESIGN ENGINEERS

Dependability of Overload Relay Assured with Silicone Fluid

Latest addition to the series of silicone-containing Hydraulic-Magnetic Circuit Breakers developed by the Heinemann Electric Company is the Silic-O-Netic type C Overload Relay. A 400-volt service unit, the Type C resets itself immediately when the circuit fault is corrected.



The Type C Relay combines hydraulic and magnetic action. When an overload occurs, a spring-loaded iron core in a non-magnetic tube filled with Dow Corning 200 silicone fluid is actuated by a solenoid coil. The core travels toward the end of the tube to complete a magnetic circuit. Resistance of the silicone fluid slows core travel providing a time delay inversely proportional to the overload current. Extreme overloads actuate the armature instantly before the core reaches the end of the tube.

Time delay characteristics are determined by core design and fluid viscosity. Of these, the easiest and least costly to vary is the choice of a fluid having the proper viscosity. Key to the consistent dependability of the time delay is the fact that the initial viscosity remains constant, even after millions of operations in service.

Unlike organic oils, Dow Corning 200 Fluid retains a relatively constant viscosity over a wide temperature range; it does not thicken or thin out. This important feature plus high resistance to oxidation and gumming helps keep the relay's actuation point unaffected by variations in the ambient temperature.

These same properties are utilized in another type Heinemann relay which is pre-set at the factory for delay intervals of from 1 second to 2 minutes. The delay interval is determined almost entirely by the viscosity of the Dow Corning 200 Fluid selected. In all these relays hermetic sealing is used to assure cleanliness and freedom from tampering. *No. 6*

New Silicone Rubber Gum Can Be Sulfur Vulcanized and Blended with Organic Rubbers to Increase Their Stability

Rubbery parts with properties intermediate between those of silicone rubber and organic rubbers can now be produced by compounding with a new silicone polymer that can be vulcanized with sulfur and blended in any proportion with organic rubbers.

Identified as Dow Corning 410 Gum and available now in commercial quantities, this new polymer can be blended with or applied as a protective coating to extend the serviceable temperature limits and the weather resistance of organic rubbers.

Brittle point in the range of —70°F and usefulness at temperatures up to 400°F can be realized by proper blending. The physical properties of the blend will fall between those of high strength silicone rubber and the organic rubber constituent.

Dow Corning 410 Gum can also be blended with oil resistant rubbers to increase their stability in contact with hot oil. Such blending also markedly improves the ozone and weather resistance of organic rubber.

Tested in an atmosphere created by an ozone generator, for example, a Buna N type rubber, compounded for test purposes, showed failure cracks in less than 30 minutes. Under the same conditions, a fifty-fifty blend of the same organic elastomer and Dow Corning 410 Gum, compounded with the same fillers and vulcanizer showed no cracks after more than 8 hours.

Priced in the same range as standard silicone rubber gums, Dow Corning 410 Gum is currently available for immediate shipment in commercial quantities. Experimental samples for testing and evaluation are available on request. *No. 7*

Silicone Paint Improves; Protects Appearance of Mercury Manifolds

To preserve a quality appearance in keeping with the automobile itself, the exhaust manifolds and crossover connection of all Mercury automobiles are coated with a heat resistant silicone based paint. Formulated by Midland Industrial Finishes of Waukegan, Ill., the coating stays black and glossy despite surface temperatures in the range of 500 F. Compare that with the burnt-brown appearance of conventional manifolds.

First used on the manifolds of the 1953 Lincoln automobile, the silicone finish is expected to last the life of the automobile. No noticeable deterioration has been observed after as much as 100,000 miles.

No additional work is required to apply the silicone paint. It's simply sprayed on the manifolds with conventional production line equipment and baked only 30 minutes at 500 F. *No. 8*

Dow Corning 6 Compound, a grease-like, non-hardening, rust preventative for ferrous alloy metal parts in delicate mechanisms and fine instruments, provides excellent protection during long time, indoor or outdoor storage. *No. 9*

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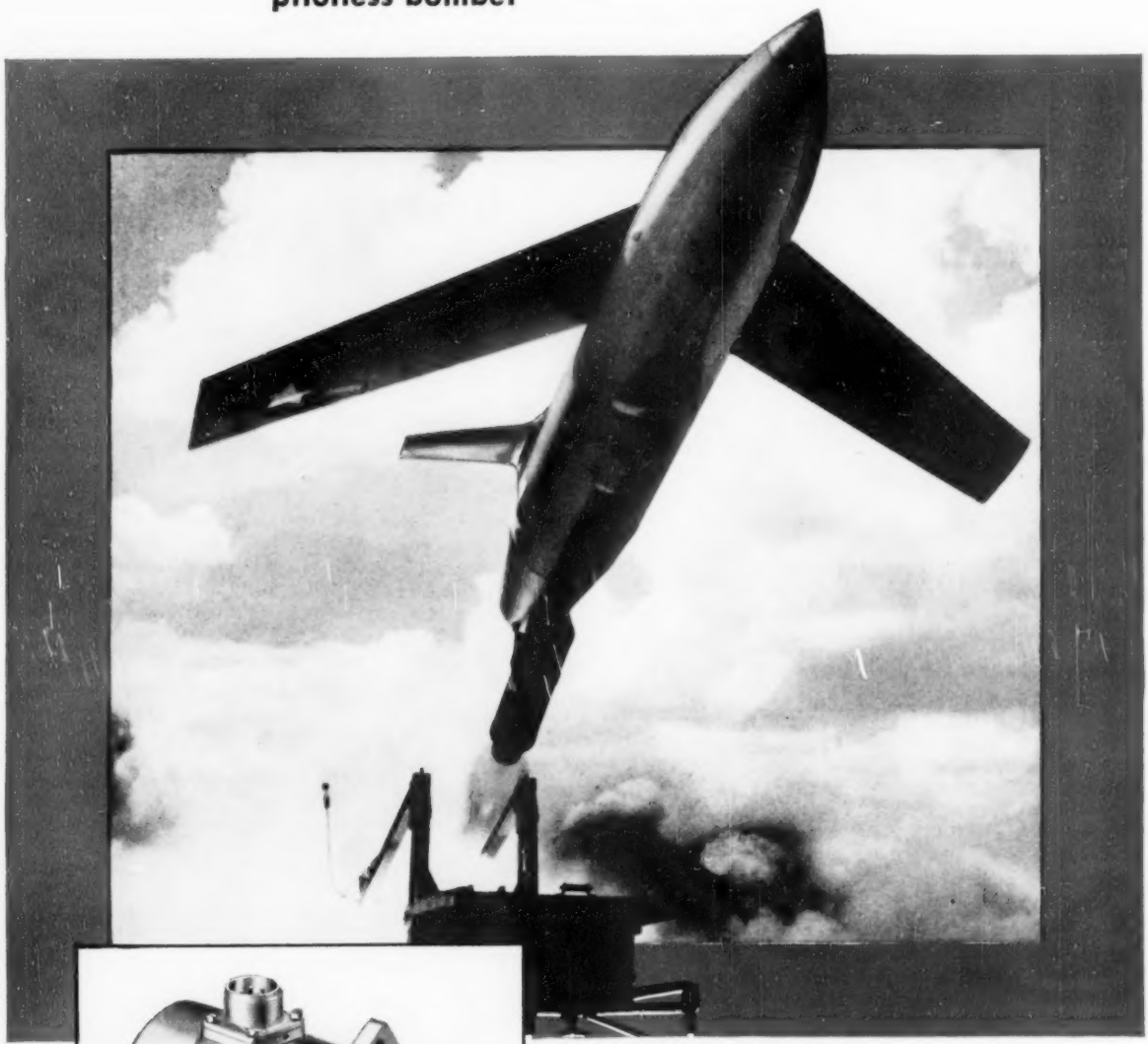

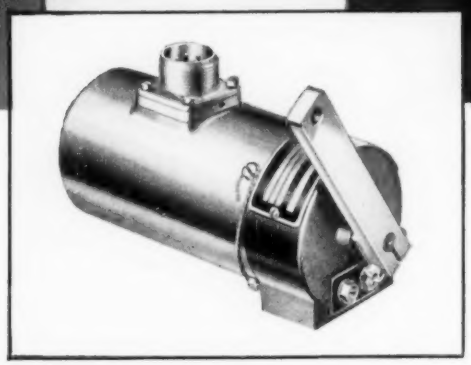

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NEW COMMUNICATIONS LINK will permit split-second cooperation between ground stations, aircraft and LAA's control center at Los Angeles International Airport.

LAA Ready for Test as Airline Feeder

- **Passengers to be flown starting next month.**
- **Belinn sees operation as key to copter future.**

By William J. Coughlin

Los Angeles—Los Angeles Airways puts its fleet of four Sikorsky S-55s into passenger service next month in a long-awaited move that president Clarence Belinn believes can make or break "the whole helicopter structure."

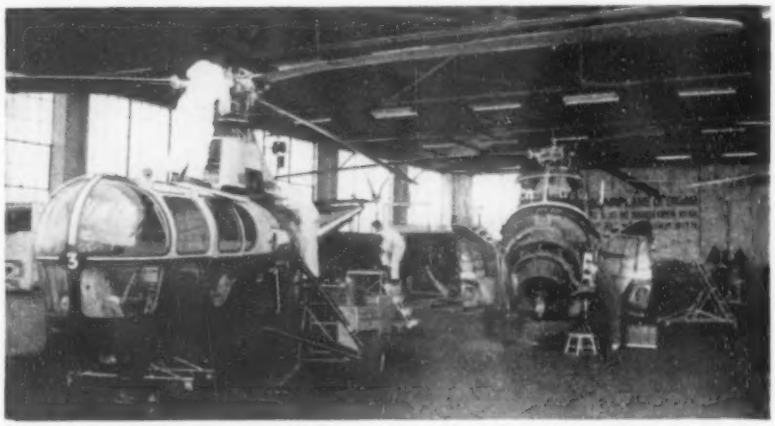
Entry of the nation's pioneer helicopter airline into the passenger field is the payoff of a longrange program planned when LAA first began to fly mail Oct. 1, 1947.

For seven years, Belinn has moved his line carefully through the preliminary stages of mail and air express service in preparation for the day when he could begin passenger flights.

The copter airline executive avoided the temptation to enter the passenger field prematurely. Meanwhile, he built up reliability on LAA's 350-mi. route network that links the Los Angeles metropolitan area. Now, Belinn believes, the time has come to make what he regards as the do-or-die test of public acceptance of the helicopter's role as an airline feeder service.

▶ **True Feeder**—Noting that Chicago's helicopter service still is in the mail stage and that the New York Airways passenger service is limited to transportation between airports, Belinn says: "Our service will be an entirely different

SIKORSKY S-55 moves into Los Angeles Airways' shop for minor changes needed to fit it for passenger role. AiResearch Aviation Service Co. is helping with interior trim.



SHOP KEEPS BUSY MAINTAINING growing fleet of Sikorsky helicopters. S-51 is at left, S-55 at right. Company took delivery of its fourth S-55 last month.

concept of service. It will be a true feeder service, taking the passengers directly to departing airliners—all ticketed and with his baggage checked through."

It is on this effort that Belinn believes continued support for the helicopter lines will depend.

"If one in three makes good, it will prove the potential is there," he says. "If all three make it, we're in clover. If all three fail, we're out in the weeds."

LAA's initial price structure is set to break even.

"We feel this will attract enough people to give us an index to the whole structure," Belinn explains. "If we come out in the black, good. If in the red, we'll have to get out and scratch."

▶ **Cheaper Than Taxi**—Belinn and his staff now are deep in planning the initial passenger flights. Service is scheduled to open about Nov. 15 between Los Angeles International Airport and the downtown Long Beach heliport, some 17 mi. away. One-way fare will be $6—cheaper than taxi fare over the same distance.

Belinn picked Long Beach for the initial test for a number of reasons. A large city with a population of nearly 500,000, it has no direct service by bluechip transcontinental flights. American and Trans World Airlines do not serve the city.

Long Beach has a good heliport. It also is close enough to the Los Angeles airport so that LAA can control the feeder service closely during its early stages.

▶ **New Terminals**—The helicopter line is building new facilities for its passenger service. Two small passenger buildings are being constructed at LAA's landing pads alongside the fixed-wing transport ramps at International Airport. Passengers thus will be able to go from the helicopter directly to their departing airliner without entering the terminal building.

The buildings will include ticket counters and passenger lounges.

Conversion of the Sikorskys to six-place passenger aircraft already has begun. LAA took delivery of its fourth S-55 last month. It is doing most of the conversion work itself with AiResearch Aviation Service Co. adding the final trim and upholstery.

▶ **New Concept**—Key to the passenger operation, however, will be a brand new communications system, linking the LAA control center to ground stations and aircraft under a new concept of metropolitan area communications.

Federal Communications Commission approved the new concept in June, although it required a change of FCC rules to permit ground-to-ground communications on AM areonautical VHF band.

The system, developed under the direction of R. A. Girvin, LAA superintendent of communications, is built around portable Gonset communicators, whose lightweight transmitter-receivers can operate on both 6-volt DC and 110-volt AC. They are built by the Gonset Co. of Burbank, Calif.

LAA already has two dozen of these $300 sets on order and plans eventual use of some 50. Both LAA mobile units and permanent ground stations will be so equipped.

▶ **Area-Wide Network**—The system will have its heart at the airline's operational control center at the Los Angeles International Airport, to be linked by leased land lines to a remotely controlled communications center located high in the Hollywood hills to overcome line-of-sight limitations.

A selective control system will enable the control center to call each station individually without activating the others, even though all are on the same frequency.

Thus LAA's aircraft, mobile units and ground stations will be linked into a single area-wide network capable of instant communication through the control center to any unit in the system.

▶ **Coordinated Connections**—This positive communications network will assure coordination between aircraft and ground vehicles in the event of flight delays, weather diversion to alternate heliports or other emergencies, providing the split-second timing necessary for successful passenger operation.

It is evident that, when necessary, such a communications system will make it possible for departing airliners to be held a few minutes to allow an incoming helicopter to make connections—since the major airline can be provided with exact ETA of the helicopter.

LAA estimates its annual cost attributable to lack of adequate communications at $74,000. The new system will eliminate this loss in addition to its other advantages.

The helicopter line will supplement its passenger service with its own limousines. When weather forces cancelation of a feeder flight, LAA can call in its ground vehicles to deliver passengers to the airport. Eventually, Belinn may introduce a custom service that will pick up the passenger by limousine at his home for the ride to the heliport.

▶ **Trunkline Domination**—How much use the 275,000 passengers who pass through International Airport each month will make of the new LAA service remains to be seen. Major airlines have promised Belinn full cooperation in his effort. Originating carriers will ticket passengers through on the helicopter when requested.

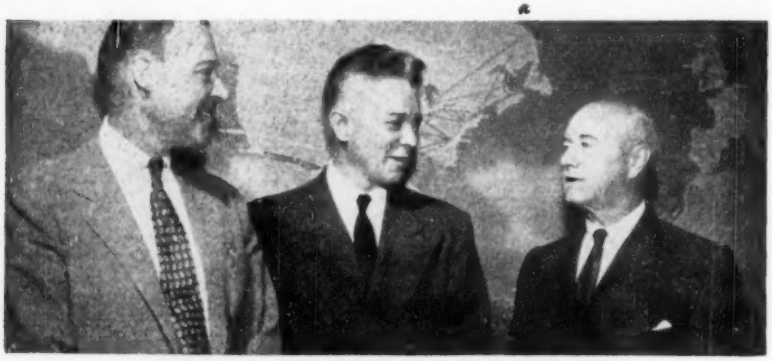
Public enthusiasm for the feeder service might find the major airlines purchasing blocks of seats on the LAA flights that connect with their own transcontinental schedules. The trunklines, without the necessity of operating their own helicopter service, thus could dominate the copter flights linked to their own schedules—perhaps even advertising such connections.

"We know that once we have the problems licked, we can do the most fantastic economic job possible for the airlines, and they know it also," says Belinn.

▶ **Peak Periods**—LAA is linking its initial passenger schedules to the peak periods of transcontinental travel. Present schedule calls for seven daily flights as a beginning, with the first departing from Los Angeles Airport for Long Beach at 9:12 a.m., departing Long Beach on the return trip at 9:27 a.m. to arrive at the airport at 9:40 a.m. in time to catch the major transcontinental departures.

Although no night flying is on the initial schedule, Belinn says: "We'll go into night operation just as fast as we can move into it."

The helicopter airline will operate



Northwest Airlines Top Brass

Donald W. Nyrop (center), former Civil Aeronautics Board Chairman and Civil Aeronautics Administrator, has taken over his new position as president of Northwest Airlines. He is shown with NWA board chairman Croil Hunter (right) and executive V.P. Malcolm Mackay. Nyrop succeeds Harold R. Harris, who resigned Mar. 4.

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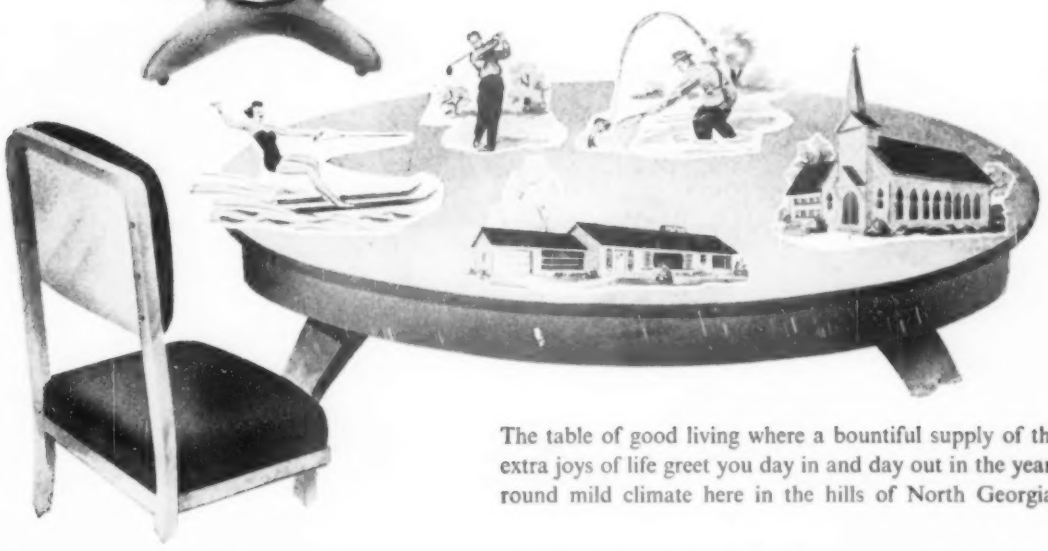

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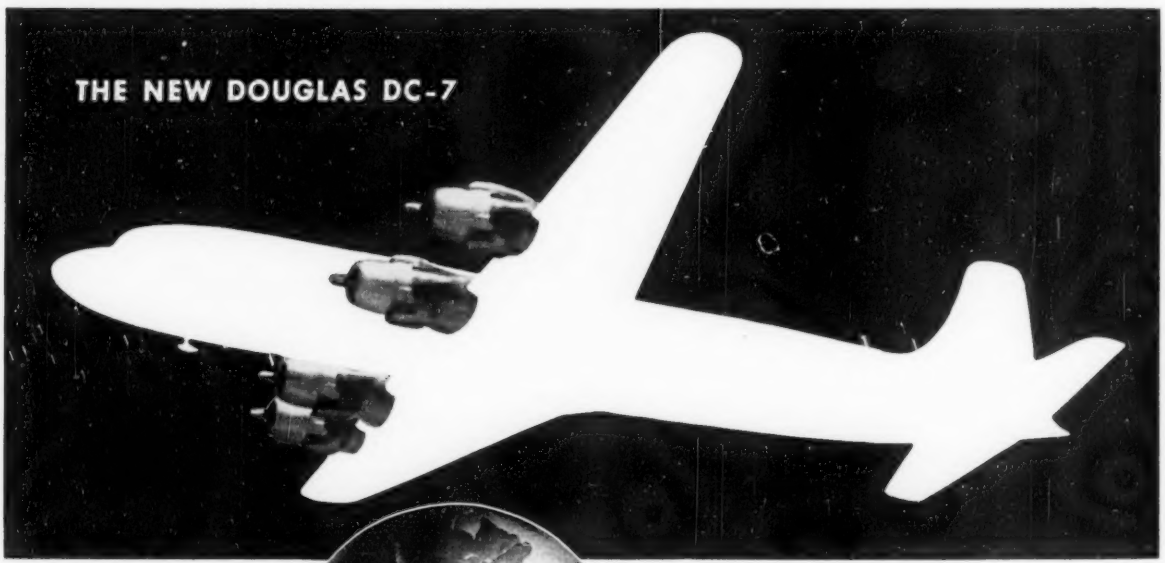

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two types of flights. One will be a passenger-only schedule tied to connecting airline flights, with mail and express subordinate. The other will be a combination schedule set up to fit the needs of the Post Office. Since the flow of mail in the Los Angeles area is outbound in the morning, for example, these flights can carry inbound passengers on the return trip.

Belinn estimates his break-even load factor at 85%. This, he points out, is not high for 350 route-miles covering 5-million persons when compared to the 3,000 mi. a conventional feeder line must fly to cover the same number.

▶ **Tough Problem**—A major worry is weather. "We have the toughest helicopter weather in the world here," Belinn says. "Stratus moving in without notice . . . local ground fog . . . We have to tie our own schedules to the VFR limitations of the helicopter even though the airlines are flying IFR. There is no use trying to set up IFR schedules we can't keep."

By next year, however, LAA expects to have the equipment for IFR operation. "Then we'll fly all the time," the LAA president says. By eliminating the worry over early morning and evening weather, this will enable full flexibility in meeting the two peak airline periods, 7-10 a.m. and 4-11 p.m.

▶ **Minor Conversion**—Changes necessary to convert the S-55s for passenger operations are minor, according to superintendent of maintenance Harry Botterud.

In addition to the cabin interior, these include installation of a fire-detecting system, a firewall shutoff valve for the lubrication system and installation of stainless steel lines, v-nuts and fittings on the engine. LAA's newest S-55 includes these changes, and the other three are being adapted with CAA-approved passenger kits.

Russell Cunningham, LAA pilot, is project engineer on the passenger conversion and such allied subjects as the color of pilot uniforms. The passenger-only flights will have a pilot as a one-man crew. Combination flights will be staffed with a pilot and a mail-express attendant.

Anticipating the success of his Long Beach operation, president Belinn already is planning expansion of passenger service to other Southern California areas, beginning next April.

IMATA-TAG Merger

Activities of the Independent Military Air Transport Assn. and the Transport Air Group will be merged Nov. 1, Ramsay Potts, IMATA president, will direct the combined operation.

L. R. (Mike) Hackney, TAG executive vice president, is joining private industry (AVIATION WEEK Oct. 11, p. 16).

Baker Pushes 'Chosen Instrument'

National's president proposes PAA as the sole U. S. flag airline, co-owned by domestic trunk carriers.

By Frank Shea, Jr.

Advocates of a "chosen instrument" for the U. S. in international airline competition got a boost last week, and this time from an unexpected source—the president of a major domestic trunkline.

Simultaneously, this same airline chief:

- Scotched rumors that his company will place any orders for turboprop Vickers Viscount, stating that if and when a turboprop aircraft is bought it will be U. S.-manufactured.
- Proposed a cut in aircoach fares on a "non-reservation" basis.

▶ **Practical Choice**—In an exclusive interview, National Airlines' G. T. Baker told AVIATION WEEK that "the emergence of a single U. S.-flag carrier is inevitable. Also, it's most practical and most sensible, and it's high time both the U. S. government and the air transport industry recognized the fact.

"Obviously," said Baker, "this means Pan American World Airways—not by political preference or choice, but from the standpoint of practicality. International airline competition being what it is today with foreign carriers pushing us hard, it seems foolish not to start our best team with both government and industry solidly behind it."

▶ **Three-Way Competition**—Baker said U. S.-flag airlines now compete not only among themselves and with foreign carriers but also must buck attempts of the domestic lines to undermine them.

"Take, for example, the hypothetical case of a midwesterner desiring to book air passage to Europe," he said. "It's his first trip, and he knows little or nothing about which airline goes where.

"He goes to the nearest domestic airline office and asks them to make his arrangements for him. The airline's reservations people cheerfully take over the task. They ticket him on their own carrier to New York—but then what do they do?

"They put him on BOAC, Air France, SAS or Sabena, spiting their own flag airlines and putting U. S. dollars into foreign treasuries. You never see any European airlines acting accordingly—why do we do it?"

In Baker's opinion there are two principal reasons:

- It's no secret that many domestic carriers have little or no love for Pan American. Whether this is because it's big and successful or whether there are personal reasons, this is pretty much an established fact. The result is that they rarely go out of their way to book passengers on PAA.
- TWA flies domestic as well as international routes. Big fear here as far as trunklines are concerned is that if they book passengers on TWA International, TWA Domestic in all probability will steal them on the return trip from New York to the Midwest. Again, as a result, they book on foreign carriers."

▶ **Some Strings**—While Baker advocates Pan American as the chosen instrument, he does not envison turning over all U. S.-flag routes to PAA without some strings attached.

In the National chief's view, the best way to handle the matter would be to set it up in such a way that all domestic carriers would maintain an interest in Pan American. He proposed that PAA:

- Let out stock for purchase by the domestic trunklines, thereby giving each a financial interest in the company. Some sort of equitable proportion between carriers by size, importance, etc., would have to be worked out.
- Appoint the presidents of the leading trunklines to its board of directors, profiting by their additional know-how and many years of combined airline experience.

▶ **Workable Team**—Baker believes the result would be a workable team, "with the entire U. S. air transport industry giving its all for the betterment of the U. S. flag's position over the world's air routes."

All other countries are solidly behind their airlines, said Baker. "We've got to do the same if we're going to compete successfully in the future.

"I think this would be a practical, sensible solution to a long-standing problem," he added. "The airlines, as a whole, would benefit; U. S. prestige abroad would be greatly increased; and, perhaps most important of all, the U. S. taxpayer would be relieved of a major portion of the international subsidy burden."

On the latter point, it is expected that Baker will find support for his proposal. There have been indications that certain Administration officials are thinking along the same lines with a view aimed at placing the international airlines on a program of increased self-sufficiency, either by merger of unprofitable operations or through application of the chosen instrument theory.

▶ **Subsidy Pressure**—There has been pressure for some action on the inter-

national subsidy picture. Critics complain that while the major domestic airlines are nearly free of subsidy, international carriers are showing increasing dependency on government support.

The domestic trunklines now cost the taxpayers $4.2 million a year in subsidy, or about half what they cost in 1947. Their commercial revenues have increased by about 255%.

In contrast, the international airlines, almost doubling their revenues in the same period, also have nearly doubled their dependence on subsidy, jumping from $24 million to $44 million a year.

Critics also say about three-fourths of the subsidy for overseas airlines goes to support operations in areas where commercial revenues are weak. It is said that in these areas the government puts down a quarter every time the passenger puts down a dollar. The question has been raised as to the wisdom of satisfying airlines' route ambitions at such a cost.

The President's Air Coordinating Committee's report proposed a partial solution to these problems in advocating merger or elimination of uneconomical route operations.

Chosen instrument advocates carry this several steps further, contending that the establishment of a single U.S.-flag carrier not only would reduce the international subsidy burden but possibly eliminate it eventually.

▶ **Mixed Reaction**—Airline officials queried by AVIATION WEEK showed mixed reactions to Baker's proposal.

Some said: "It's too sensible, that's why it will never come about." Others commented: "It's ridiculous"; while still others said: "We'd like to get PAA president Juan Trippe's reaction."

Many thought the proposal too broad and declined comment without getting down to more specific details.

▶ **Turboprop Interest**—Scotching rumors that National might buy the Vickers Viscount, Baker told AVIATION WEEK that if and when NAL purchases a turboprop aircraft it will be U.S. manufactured.

"This doesn't infer anything against the Viscount," he said. "In many respects, we think it's a fine plane. As a new development, we've looked it over very carefully, but we have no intention of buying abroad at this time or at any time in the foreseeable future."

Baker reasons that it is always best to have the manufacturer and the user on the same "piece of land." He said there can be a lot of "bugs" in any new airplane, and things can be a lot simpler if you do not have an ocean between the airline and the manufacturer.

"We are definitely interested in turboprop aircraft, however, and we're anxious to see further development along those lines in this country. There's no question that U.S. manufacturers were caught napping in this instance," he said, "I hope they're going to make up for lost time."

Baker made one further observation on the Viscount which, he said, excluding all other factors would prohibit NAL from purchasing the aircraft. This is the fact that a carrier has to achieve a 64% load factor on the airplane before he can make a profit. "That won't do for our purposes," he stated. "We need a much bigger airplane with a lower load factor."

▶ **New Fare Setup**—Discussing aircoach, Baker revealed that he is working on a new fare-reservations setup for NAL.

He envisions a new fare structure for aircoach, whereby the fare would be lowered and reservations, for the most part, eliminated. Using hypothetical figures, he said: "Take an ordinary $50 coach fare. What I would like to do is, say, lower that fare by $10 and place coach passengers on a standby seat-available basis. For those who don't care what time they leave, it would be more economical and should compensate for the inconvenience.

"For those coach passengers who must meet a time schedule, I would add the $10 and give them a firm reservation. The amount of money that would be saved in administrative work and reservations handling would more than compensate for the general fare reduction.

"Also, it would most surely result in more volume traffic."

Chances Dim for Policy On Surface Mail by Air

The outlook is dim for establishing an Administration policy on shipping first-class surface mail by air.

A panel of the National Transportation Council, reporting to Commerce Undersecretary for Transportation Robert Murray, has failed to reach unanimous conclusions on a surface-mail-by-air policy.

The panel's report was submitted to the council Oct. 14, but NTC referred it back to the study group, headed by Dr. John Frederick, professor of transportation at the University of Maryland.

▶ **Court Threat**—Meanwhile, expansion of the mail experiment to West Coast flights (AVIATION WEEK Oct. 18, p. 116) is confronted by the united opposition of 74 railroads.

The railroads argue that the experiment should not be expanded until basic issues are resolved in a proceeding ordered by Civil Aeronautics Board when it approved continuation of the experiment on the East Coast to Sept. 30, 1955 (AVIATION WEEK Oct. 4, p. 79).

Railroads claim the "right" to intervene in the West Coast case and block approval by CAB without a hearing. If the Board denies the intervention petition, the railroads may take court action.

Two airlines, Western and United, have approved the rate of 18.98 cents a ton-mile set by the Postmaster General for shipments of surface mail by air, on a space available basis, among 19 points in California, Oregon and Washington.

▶ **Slick, Riddle Bids**—Slick Airways and Riddle Airlines have filed to participate in the CAB proceeding on the East Coast service.

The Postmaster General has supported Slick's bid to participate in the experiment, saying: "So long as this class of mail transportation remains in an experimental stage for the purpose of study and continuing development, the department believes that the public interest logically requires that there be available for participation the full excess capacity and schedules of existing certificated air transport facilities."

In the airfreight case, now being heard by CAB examiner James Keith, Riddle is applying for a certificate to transport mail and freight between Florida and New York.

Passenger Airlines Winning Freight Fight

The scheduled passenger airlines appear to be winning their eight-year battle with all-freight carriers.

While American Airlines asserted its dominance in the airfreight field by announcing a $10.4-million order for seven DC-6As with Douglas Aircraft Co., the future of the only two remaining certificated all-freight lines—Flying Tiger Line and Slick Airways—was dubious.

American's order will boost the carrier's present fleet of three DC-6As to 10 by mid-1956. Delivery of three of the aircraft is specified for May, two for June and two for July 1956.

▶ **Grave Doubts**—Civil Aeronautics Board approved an arrangement proposed by Slick and Flying Tiger, under which FTL, would bow out of the freight business and become a leasing operation (AVIATION WEEK Oct. 18, p. 17).

But the Board's qualifications that Tiger would have to come to an agreement with employes on severence pay left grave doubts that the proposed arrangement would materialize.

Failure to reach agreement with employes, notably pilots, on labor liability after 18 months of negotiating finally caused the two freight airlines to abandon merger plans. They estimated that their "exposure" to labor claims under merger would be between $3 mil-

lion and $6 million. With this past, Flying Tiger spokesmen see little possibility of arriving at an agreement at this time.

▶ **Proxy Fight**—In addition, Flying Tiger pilots have opposed vigorously the latest proposal of Slick and Flying Tiger. They asked the Board to disapprove it and insist that the airlines go through with a merger, assuring their rights under the Railway Labor Act.

Adding another complication, Tiger pilots have launched a drive for proxies, in an attempt to wrest control from the present management at the annual stockholders' meeting that will be held Oct. 29.

Because of the short time, and the great difficulty involved in rounding up blocks of proxies, the campaign is not given much chance of success.

▶ **Qualifications**—The two qualifications CAB attached to its approval of the Slick-Flying Tiger arrangement:

- For a period of 18 months, Slick give preferential consideration in recruiting employes to persons dismissed from FTL as a result of the arrangement.
- Tiger must file by Oct. 29 "an agreement with its employes . . . providing for payments of money in definite or ascertainable amounts by Tiger to persons who . . . may be furloughed or dismissed . . . within six months as a result of the arrangement."

CAB Will Test New Airmail Pay Formula

Civil Aeronautics Board has put the 13 domestic trunk airlines on a new temporary mail rate, based on a multi-element formula favoring shorthaul carriers. The new rate is retroactive to Apr. 1.

In addition to linehaul payments of 30.10 cents a ton-mile, airlines will be paid for each pound of mail enplaned, ranging from 4.89 cents at the largest airports to 14.67 cents at the smallest airports (AVIATION WEEK Oct. 11, p. 13).

▶ **November Basis**—First application of the new formula will be for November. Each airline's ton-mile yield during the month will be applied to the tonnage carried during the previous seven months to determine the mail pay for this period.

The Board was blocked from establishing the new rate on a final basis until a proceeding is held by objections filed by Trans World Airlines, United Air Lines, Slick Airways and the Postmaster General.

Under the new formula, TWA's yield would be 37.03 cents a ton-mile, and United's 38.04 cents. This compares with their present rate of 45 cents a ton-mile.

The Postmaster General has proposed a rate of 25.88 cents a ton-mile for service mail pay. Under the new CAB formula, the lowest yield would be TWA's 37 cents.

If United, TWA or any other party files an objection to establishing the new rate on a temporary basis, it would preclude the inauguration of accounting procedures Nov. 1 to calculate the rate under the new formula.

CAB Approves TWA, Braniff Interchange

Civil Aeronautics Board has approved an equipment interchange between Braniff Airways and Trans World Airlines at Amarillo, Tex., to provide one daily roundtrip through flight between Houston and the West Coast.

CAB vice chairman Harmar Denny and members Josh Lee and Joseph Adams supported the interchange. It was opposed by chairman Chan Gurney and member Oswald Ryan.

The Board will reconsider the interchange in connection with the renewal of Continental Airlines' authority to serve Houston on interchange flights with American.

Benefits that will result from the new interchange, the Board majority declared, "include . . . the providing of services between Texas and California points competitive with the present monopoly operations of American and a strengthening of Braniff by permitting it to regain a portion of the traffic heretofore diverted from it by the Continental-American interchange."

Bonanza Fights SWA 2-0-2, DC-3 Rate

Bonanza Airlines has challenged the economy of operating a mixed fleet of DC-3s and Martin 2-0-2s by Southwest Airways, recently approved by Civil Aeronautics Board (AVIATION WEEK Oct. 11, p. 18).

This is the latest development in the running feud between the two local service carriers. In the Southwest renewal case, now in process, Bonanza is seeking SWA's routes, arguing it could operate them more economically and with less subsidy.

Judicious use of Southwest's nine DC-3s and three 2-0-2s, the Board found, enabled it to realize substantially higher passenger revenues per mile than it would have earned with all DC-3 service.

For the period at issue, July 22, 1953 to June 30, 1954, Southwest would have saved $132,942 with an all-DC-3 operation, Bonanza claimed in attempt to upset CAB's decision.

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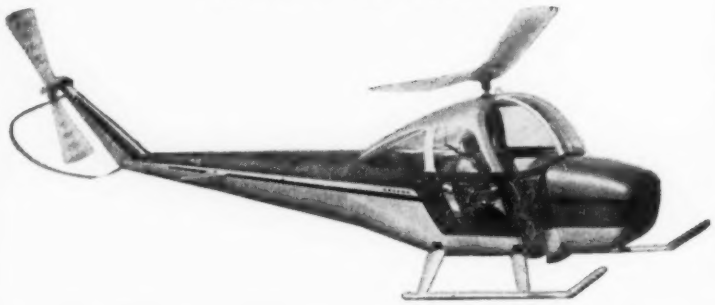

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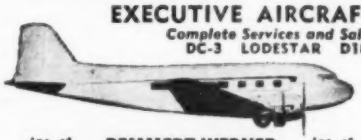

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IMPORTANT! Check this ad carefully each time it appears—new offerings, never before advertised, will be listed! This group is just a small sample of our huge stock. Let us screen your inquiries for aircraft parts, accessories, AN and NAS hardware!

RADIO EQUIPMENT

Pieces	Part Number	Description
117	AA100-481-2	Antenna Lead
89	AA29026-1	Antenna Lead
12	MR-11-D	Antenna Loop Unit
8	MN-20-A	Antenna Loop
14	MT-53-B	Antenna Lead Unit
3	MT-5E	Antenna Reel
26	MS-49A	Antenna Transfer Switch
46	AL72092-1	Base Assy.
570	MS-14A	Box (Junction)
4	MS-14BB	Box (Junction)
4	MS-51-AA	Box (Junction
1,018	13018-A	Box (Interphone)
230	AA26172-1	Cable Assy.
11	AC58789-1	Cable Assy
10	AC50789-2	Cable Assy
21	AC58790-3	Cable Assy.
20	AC72386-1	Cable Assy
37	AI72392-1	Cable Assy
30	73527-1	Cable Assy.
37	AA100481-2	Cable Antenna Lead
71	AC58789-1T161	Cable
45	AC58970-1	Cable
33	AC58973-3	Cable
296	272827-10	Cable
276	272828-10	Cable
19	AC589683	Cable
17	AC587789-1-161	Cable Assy.
157	AC58792-3-36	Cable Assy.
51	AC58969-3	Cable Assy.
33	AC58973-3	Cable Assy.
125	A14109-2	Capacitor
3	A-30401	Capacitor
48	AA28707-2	Coil Inductor
84	84555	Coil Assy.
93	AA100102-1	Coil Lead Assy.
242	3190580	Coil
38	MR9B	Control Remote
81	3616	Control Wireless Operator Unit
7	MS41AA	Control Wireless Operator Transfer Unit
3	MN-52-B	Control Azimuth
5	854364-1	Control Rheostat
222	D-12184	Converter
220	A15082	Dial
33	AC55655-2	Dial Screw Assy.
142	BX42-7	Dynamotor
7	C56728-2 (DA1-A)	Dynamotor
13	MP28BA	Dynamotor Modulator Unit
239	7884	Filter Radio
93	AC-60524	Filter Radio
237	313437	Filter Light
11	3937-A	Filter Generator
42	A25043	Knob
380	A28100	Knob
29	AL71784-1	Oscillator
52	BX15-5	Potentiometer
32	RA-10DB	(10.05.0-MC)
	4 Channel	(5.0-2.0-MC)
	(1100-400KC)	(400-150KC)
		Radio Receivers
68	BX17-3	Transformer
79	BX17-16	Transformer
80	A16901	Transformer
2	A19770	Transformer
171	AA26614-1	Transformer
68	AA27565-2	Transformer
92	AL71765-4	Transformer
58	AL71765-6	Transformer
302	K5898733AB	Transformer
23	TA-12B	Transmitters Broadcast

A N CONNECTORS

Pieces		Pieces		Pieces		Pieces	
262	AN3100-2A-1S	108	-48-3S	82	-PR28-1P	178	-A18-1S
74	-4S-3S	459	-MS-58	20	-28-11P	24	-B18-1S
53	-8S-1P	556	AN3101-8S-1P	34	-28-11S	37	-B18-1S
15	-10SL-3P	70	-B8S-1P	70	-32-1P	35	-18-4S
81	-12S-3S	161	-8S-1S	154	-32-1S	66	-B18-4S
753	-12-5P	482	-8S-1S	17	-40S	71	-A18-5P
2,098	-12-5S	510	-A8S-1S	49	-40-11S	158	-B18-5P
222	-12-5S	52	-A8S-1S	52	-44-1P	100	-18-5S
146	-14S-2P	50	-14S-1P	27	-48-7CS	29	-A18-5S
69	-14S-4P	35	-A14S-9P	61	AN3106-A8S-1P	60	-A18-5S
23	-14S-5S	13	-B18-9P	31	-A8S-1P	161	-A18-6S
800	-A14S-5S	67	-A20-29P	105	-A8S-1S	3,376	-B18-6S
42	-A14S-6P	201	-B22-14P	172	-A10S-2P	132	-B18-6S
75	-14S-7S	10	-A22-23S	268	-A10S-2S	52	-18-10S
33	-14S-9S	49	-A24-5S	114	-A10S-2S	578	-A18-10S
1,152	-A16S-1S	81	AN3102-8S-1P	36	-A10S-2S	173	-18-11S
10	-A16S-8S	454	-10S-2S	50	-10SL-4S	155	-B18-12P
24	-A18-1P	772	-A10S-2S	181	-A10SL-4S	43	-A18-15P
75	-A18-1P	78	-10SL-4P	1,674	-A10SL-4S	47	-18-15S
41	-18-4S	34	-10S-8S	306	-B12S-3S	185	-B20-1P
582	-18-12S	591	-12S-3P	157	-A12S-3S	24	-B20-1P
28	-18-15S	24	-M12S-3P	88	-A12-3S	36	-B20-1S
151	-A18-16S	173	-12S-3S	126	-B12S-4S	25	-B20-7S
84	-A20-1P	48	-12S-3S	80	-A12S-4S	73	-A20-12S
124	-A20-1S	11	-PR14S-1P	351	-A12S-4P	755	-B20-12S
124	-A20-27P	61	-PR14S-9P	46	-A12S-4P	50	-A20-25S
698	-22-5S	20	-A14S-9P	265	-B12S-4P	246	-A20-26S
32	-22-21P	330	-16S-5P	69	-A12-5P	47	-B20-27S
75	-24-5P	342	-16-13P	60	-A12-5S	219	-B20-29S
249	-A28 11P	53	-A18-4P	119	-B12-5S	132	-B22-5P
16	-PR28-11P	1,460	-18-4S	91	-A14S-1P	29	-B22-14P
56	-PR28-12P	1,575	-18-5S	105	-A14S-1S	96	-A22-19P
129	-32-1S	28	-A18-12S	197	-A14S-1S	414	-B22-19P
134	-32-6P	96	-20-2S	275	-B14S-1S	60	-A22-27S
249	-A32-6P	327	-20-2S	120	-A14S-5S	14	-B24-2P
45	-32-7P	1,122	-20-3P	34	-A14S-6P	78	-B24-3P
98	-PR32-7P	1,104	-20-27P	26	-B14S-6P	105	-B24-5P
92	-32-C7P	207	-22-1S	91	-A14S-6S	122	-B24-5P
96	-32-9P	80	-22-4P	63	-A14S-7P	51	-A24-7P
240	-32-9S	222	-22-5S	32	-A14S-7S	40	-M24-7S
301	-32-14P	349	-24-1S	30	-A14S-9S	89	-M24-20P
132	-32-14S	15	-24-5S	138	-B16S-2S	70	-B28-11P
27	-36-7P	196	-24-7S	84	-B16S-5S	139	-28-12S
26	-36-7P	22	-A24-7S	67	-B16S-8S	94	-28-12S
358	-36-19P	67	-24-7S	89	-A16S-8P	105	-B32-6S

U G FITTINGS

Pieces		
556	UG 175/U	Adapter
97	UG 290-2	Plug
191	PL 293	Connector
15	UG 566/U	Coaxial T
77	UG 27A/U	Adapter
94	UG201/U	Adapter
128	UG 255/U	Adapter
116	UG 104/4	Adapter
97	UG 290-2	Plug
1,979	UG 21/U	Plug
27	UG 260/U	Plug

A N CONDUIT FITTINGS

Pieces		
840	AN3050-8	Ferrule
2,730	-10	Ferrule
5,469	-20	Ferrule
711	-24	Ferrule
602	AN3051-6	Ferrule
440	-16	Ferrule
9,302	AN3052-4	Ferrule
22,525	-6	Ferrule
340	-10	Ferrule
461	-12	Ferrule
543	-24	Ferrule
6,200	AN3053-3	Ferrule
32,850	-6	Ferrule
69,631	-8	Ferrule
8,363	-10	Ferrule
45,563	-12	Ferrule
20,001	-16	Ferrule
21,695	-20	Ferrule
2,214	-24	Ferrule
13,181	-32	Ferrule
403	-40	Ferrule
200	AN3054-14	Nuts
484	-16	Nuts
11,032	-20	Nuts
347	-24	Nuts
6,712	-28	Nuts
24,092	-32	Nuts
726	-40	Nuts
745	AN3055-8-4	Adapter
184	-12-4	Adapter
4,402	-18-10	Adapter
125	-40-20	Adapter
607	AN3056-4	Coupling
5,036	-6	Coupling
10,285	-10	Coupling
11,260	-12	Coupling
147	-12D	Coupling
637	-16	Coupling
2,280	AN3057-3	Adapter
108	-4	Clamp
934	-20	Clamp
11,628	AN3058-3	Coupling
4,314	-4	Coupling
8,382	-8	Coupling
5,221	-10	Coupling
11,021	-12	Coupling
3,408	-20	Coupling
575	AN3059-16	Bushing
104	-20	Bushing
3,937	AN3060-3	Coupling
130	-8	Coupling
1,173	-10	Coupling
272	-16	Coupling
185	-20	Coupling
115	-40	Coupling
138	AN3061-6	Coupling
632	-20	Coupling
4,435	-24	Coupling
110	-28	Coupling
203	-40	Coupling
2,852	AN3062-4	Coupling
2,674	-6	Coupling
588	-10	Coupling
630	-20	Coupling
145	-32	Coupling
337	-40	Coupling
774	AN3063-3	Coupling
1,641	-8	Coupling
213	-32	Nuts
826	-40	Elbow
59,822	AN3064-3	Connector
3,349	-6	Connector
101	-8	Adapter

COMMERCIAL SURPLUS SALES CO.

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News Sidelights

There is no strong substantiating evidence that aft-facing seats would materially decrease the death rate in transport aircraft accidents, A. Howard Hasbrook, associate director of Aviation Crash Injury Research, Cornell-Guggenheim Aviation Safety Center, says. In an open letter to New York newspapers, Hasbrook comments: "Unfortunately, the problem of increasing safety in air transportation is a most complex one, and cannot be achieved as simply as those favoring aft-facing seats imply."

BeeCraft Associates Inc. has changed its name to Bee Aviation Associates Inc., to eliminate confusion with Beech Aircraft Corp.'s trademark Beechcraft. Company's certificated single-place Honey Bee has been flown by more than 120 pilots; new four-place Queen Bee (AVIATION WEEK Jan. 11, p. 17) is in engineering stage.

Columbia Broadcasting System will produce a 26-week series of half hour TV programs devoted to the history of the Air Force in World War II, possibly including Korea. Series, tentatively entitled Crusade in the Air, will be based on official USAF film.

Wichita's new municipal airport will be dedicated formally October 31. Former airport was purchased by the Air Force as a B-47 training base, now is known as McConnell AFB.

Four San Diego aircraft companies—Convair, Ryan Aeronautical, Rohr and Solar—expect an employment level next year slightly lower than 1954. Convair, with mid-year employment of 22,872, expects to level-off at 20,000; Ryan hopes to remain at about 4,000, compared to the postwar peak of 4,400 in 1953; Rohr expects to stay at somewhat over 5,300, and Solar says its force should be about the same as at present, 2,600.

Col. J. G. Vincent, pioneer aircraft powerplants engineer who was a leading developer of the Liberty engine of World War I and who contributed to refinement of the Packard-built Rolls-Royce engines of World War II, is expected to retire soon from Packard's board of directors. He probably will continue as an engineering consultant of the new Studebaker-Packard Corp.

WHAT'S COOKING?—Secretary of the Air Force Harold E. Talbott (center) takes a close look at one of Minneapolis-Honeywell's precision HIG gyros during a recent tour of the facility, where he also spoke at a mass-meeting of 10,000 employes that launched a company-union campaign against waste in production. When he visited the rigidly controlled gyro assembly rooms with Paul B. Wishart (right), M-H president, and Robert I. Wishart (no relation), secretary-treasurer of AFL Teamsters Local 1145, he donned nylon garb to guard against lint and dirt reaching instruments.

AVIATION CALENDAR

Oct. 27-29—National Business Aircraft Assn., seventh annual meeting and forum, Hotel Adolphus, Dallas.

Oct. 28-29—Aircraft Electrical Society, 11th annual display meeting, Pan Pacific Auditorium, Los Angeles.

Nov. 1-5—American Welding Society, fall meeting, Sherman Hotel, Chicago.

Nov. 2-19—The American University, eighth Air Transportation Institute, Washington, D. C.

Nov. 4-5—American Helicopter Society, first Western Forum, Institute of the Aeronautical Sciences Building, Los Angeles.

Nov. 4-5—Airborne and Navigational Electronics, East Coast conference, Sheraton-Belvedere Hotel, Baltimore.

Nov. 8-9—National Aviation Trades Assn., annual convention and meeting, Biltmore-Terrace Hotel, Miami Beach, Fla.

Nov. 8-9—National Air Taxi Conference, annual meeting, Biltmore-Terrace Hotel, Miami Beach, Fla.

Nov. 8-10—Air Industries & Transport Assn. of Canada, annual meeting, Chateau Frontenac, Quebec City.

Nov. 9-12—Air Line Pilots Assn., convention, Sheraton Hotel, Chicago.

Nov. 10-12—Industrial Management Society, 18th National Time and Motion Study and Management Clinic, Hotel Sherman, Chicago.

Nov. 11-12—Airmail Pioneers, division reunion, Hollywood Roosevelt Hotel, Los Angeles.

Nov. 12-13—National Symposium on Quality Control and Reliability in Electronics, Statler Hotel, New York.

Nov. 15-17—Aviation Distributors and Manufacturers Assn., 12th annual meeting, Mayflower Hotel, Washington, D. C.

Nov. 15-17—Magnesium Assn., 10th annual meeting, Hotel Chase, St. Louis.

Nov. 17-19—California Association of Airport Executives, semi-annual meeting, Sainte Claire Hotel, San Jose, Calif.

Nov. 18-19—American Society for Quality Control, ninth Midwest conference, Baker Hotel, Dallas.

Nov. 29-Dec. 3—American Society of Mechanical Engineers, Aviation Division, annual meeting, New York.

Nov. 30-Dec. 3—American Rocket Society, ninth annual meeting, Hotel McAlpin, New York.

Dec. 17—Wright Day Dinner, Statler Hotel, Washington, D. C.

Jan. 19-23—World Trade Fair of Aviation, Miami International Airport, Miami, Fla.

Jan. 24-27—Plant Maintenance & Engineering Show, produced by Clapp & Poliak, International Amphitheatre, Chicago.

Mar. 28-Apr. 1—Ninth Western Metal Exposition and Congress, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles.

Apr. 18-21—Society of Automotive Engineers, Golden Anniversary Aeronautic Meeting, Aeronautic Production Forum and Aircraft Engineering Display, Hotel Statler and McAlpin Hotel, New York.

Apr. 24-28—Airport Operators Council, 1955 convention, Olympic Hotel, Seattle.

May 4-6—Fourth International Aviation Trade Show, sponsored by Aircraft Trade Shows, Inc., 69th Regiment Armory, New York.

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LETTERS

Burbank Boggle

I certainly agree with the letter "Burbank Boggle" by W.M.C. in the Aug. 30, 1954, issue. Although I live only a mile from the Burbank Air Terminal, I recently made a train trip to Yuma, Ariz., only because of the lack of plane service from Burbank. It seems CAB has given L.A.'s International Airport a monopoly which is both irritating and inconvenient to many would be air travelers.

What Mr. W.M.C. neglected to state is that, besides Burbank and Glendale, the Burbank Air Terminal is in much easier access to: San Fernando, Sunland, La Crescenta, La Canada, Altadena, Pasadena, downtown Los Angeles, Hollywood, Universal City, Studio City, North Hollywood. I say give the Burbank Air Terminal more plane service and watch congratulations flow in from disgruntled air travelers who have been forced to make the long trek to International Airport.

JOHN J. HANSEN
436 South Beachwood
Burbank, Calif.

Braniff DC-3

The Aug. 30 AVIATION WEEK stated that "Braniff Airways DC-3 struck a power line and crashed last week while approaching Mason City, Iowa, during a blinding thunderstorm . . ." (p. 7).

The newspaper and radio reports carried a statement to this effect for the first 12 hours following the accident. This erroneous report apparently came as a result of a power line in the general vicinity having been blown down during a violent thunderstorm.

The flight was holding some 15 miles from the airport and had advised it was awaiting the passage of a thunderstorm over the field.

Within 30 hours after the accident newspapers were carrying a corrected version of this story. . . .

Such inaccuracies are expected of the daily press. . . . We are disappointed to have such inaccurate reporting coming from an aviation magazine with the high reputation and regard that we have for your publication.

L. HOMER MOUDEN, Chairman
Regional Safety & Engineering Committee
Air Line Pilots Assn.
4712 Troost Ave.
Kansas City, Mo.

(We regret the error; news wires in the New York City area did not carry the correction.—ED.)

Mile Is Shorter

Just noticed that the Oct. 11 issue of AVIATION WEEK continues an error which was started and published in several newspapers. That error is on page 16 and regards the length of the nautical mile: the item calls it 6,080.20 ft. long. Actually on July 1, 1954, the CAA, as ordered by the Department of Commerce, standardized on the international nautical mile of 6076.1033 ft. The Defense Department also agrees.

We are correcting our little handbook and I trust you will correct your reference files.

NICK DEN TEX
Pratt & Whitney Aircraft Div.
United Aircraft Corp.
East Hartford 8, Conn.

Praise

I am indeed complimented that you saw fit to include my speech on national airpower policy in your Sept. 27 issue.

I feel that this message states explicitly our national position, and I am gratified that it will receive wide circulation through a magazine which has the stature of AVIATION WEEK.

SEN. LEVERETT SALTONSTALL

. . . This is my first opportunity to say thank you for the complimentary reference to my being a "hardboiled optimist" in the sky tourist business.

All of us in aviation—and I respectfully include editors of trade publications—owe our future to the extension and broadening of air travel. To that extent your editorial decrying negative or "saturation" thinking was most refreshing.

On the other hand, no one can say now that some fare increases may not be necessary in the future, as your editorial wisely pointed out.

It was a thoughtful and thought-provoking piece.

R. S. DAMON, President
Trans World Airlines, Inc.
380 Madison Ave.
New York 17, N. Y.

I have read with interest your editorial, "Helping Communities in Trouble," in your Sept. 16 issue. We here at Bell Aircraft appreciate the fine things you said about Douglas and North American as well as the mention of Bell Helicopters. We in the helicopter business carry on a concerted campaign of being of assistance to communities, municipalities and people in distress and we seldom get any recognition whatsoever for our efforts.

JAMES C. FULLER
Public Relations Director
Bell Aircraft Corp.
Helicopter Division
P. O. Box 482
Ft. Worth 1, Tex.

This is an acknowledgment of your editorial, "Helping Communities in Trouble." As you know, the council maintains a selection of background material on the helicopter and attempts to keep this as up to date as possible. Your editorial displays such a thorough understanding of the value of the 'copter, aside from its strictly military and commercial application, that we would very much like to reproduce this as one of the papers we distribute.

DON RYAN MOCKLER, Director
Helicopter Council
Aircraft Industries Assn.
Washington 5, D. C.

Phil Klass wrote a feature article about Balco's new HT-2 200-deg. capacitor in the Avionics section recently. Needless to say we . . . are grateful to AVIATION WEEK for the boost. What you might be interested in is the reader interest that his article stirred up. Enclosed is a list of the companies represented among the many responses that came in as a result of the story. The degree of interest can be judged from the fact that most of the inquiries were followed by sample-quantity orders. Even though most of these sample quantities have not as yet been completely tested, we have already received several larger repeat orders based on the customers' evaluations. It is apparent that Mr. Klass showed good judgment in feeling that our product would fill a critical need for your subscribers. He handled the technical details accurately and did a fine job of putting the engineering facts into a very readable form. His conscientious verification of all our claims has convinced us that anything under his byline can always be taken as "the straight dope."

BALCO RESEARCH LABORATORIES
M. K. Goldstein, President
49-53 Edison Place,
Newark 2, N. J.

I have just completed reading your very interesting and complete article on our DC-7 operations by George L. Christian and . . . thank you. We have circularized all our employes, advising them of the article.

F. J. SCHWAEMMLE
Director of Information Services
Delta-C&S Air Lines
Municipal Airport
Atlanta, Ga.

I've just seen the story (by William Coughlin) on our company in the Oct. 4 AVIATION WEEK and I think you are to be complimented. Everyone here who has seen the story thinks it is one of the best yet done from the standpoint of accuracy and balanced presentation.

RALPH W. KUMMER
Public Relations Manager
Hiller Helicopters
Palo Alto, Calif.

We would like to have authority to reproduce Selig Altschul's article on the local service airlines, which appeared in the Aug. 23 issue. This article tells the local service story very clearly and we would like to have it read by a number of people in our territory. Naturally, AVIATION WEEK would receive full credit.

C. M. BRITT
Vice President-Sales
Southern Airways, Inc.
Atlanta Airport
Atlanta, Ga.

. . . The article on local service airlines is excellent and will do much to inform the public concerning the requirement of the local service airlines for permanent certificates.

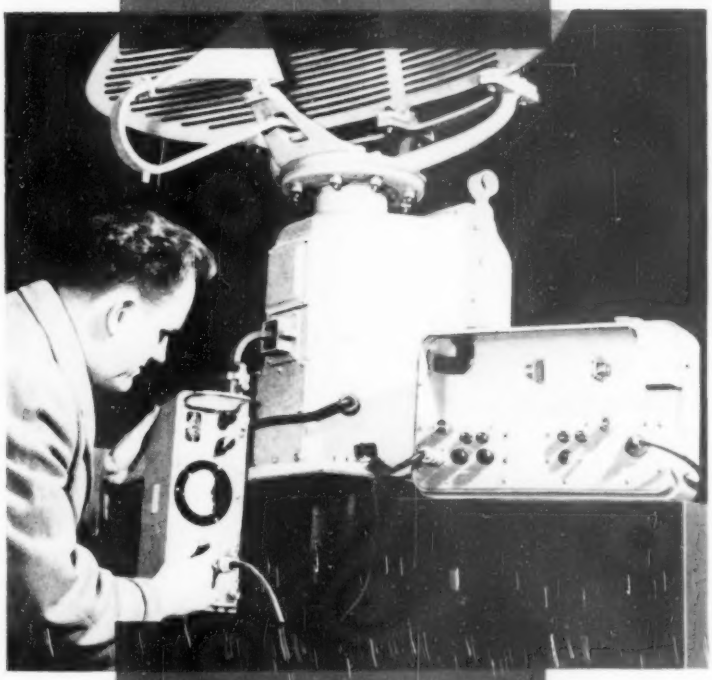
DON NYROP

(Other Letters on p. 69)

NEW VSWR TEST SET

Model 539 VSWR Test Set consists of removable indicator unit (top) and power supply (bottom) fitted in compact aluminum combination carrying case.

for rapid and accurate check of X-Band Radars



■ Now available is the Sperry Microline® Model 539, VSWR Field Test Set, designed for accurate measurement of the voltage standing-wave ratio of X-band radar equipment during installation, maintenance and repair. This compact portable test set is also ideal for use in production and laboratory testing.

■ Model 539 is a direct-reading reflectometer-type instrument which consists of a klystron oscillator, high directivity directional coupler, detector, amplifier and indicator, power supply and modulator. Calibration is accomplished with a reference mis-match.

■ The simplicity of adjustment and operation of the test set make it extremely useful for accurate measurements over the entire range. It is particularly useful in adjusting a standing-wave ratio since the meter gives a continuous indication. Indicator unit can be easily connected to the equipment to be tested with a thumbscrew-operated clamp.

■ This test set is approved by the military as the AN/UPM-12 meeting all the requirements of Specification MIL-T-945A.

For convenience in field work, the microwave indicator unit can be easily removed from carrying case.

SPECIFICATIONS

VSWR Ranges	1.05–1.3±5% 1.3–2.0±5% 2.0–3.0±10% 3.0–10.0 uncalibrated
Freq. Range	8.5–9.6 kmc
Waveguide Connection	RG52/U (1 x ½ waveguide) or RG51/U (1¼ x ½ waveguide) through accessory adapter
Dimensions	Length 19¾ in. Width 12 in. Height 10¾ in.
Weight	35 lbs.
Power Requirements	105–125 volts 50–1000 cycles 75 watts

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High-strength aluminum-alloy nuts meet AN steel nut tensile loads. Nylon locking inserts guarantee reusability through 50 on-off cycles.

Approved for use on Air Force, Army and Navy aircraft, the new ESNA Blue "J's" are lighter than any other self-locking nuts of equivalent strength.

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☐ Here is a drawing of our product. What self-locking fastener would you suggest?

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